



Frontiers

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Capturing the **Dream**

The 787 Dreamliner lifts off from
Paine Field, Washington, 10:27 a.m.
Pacific time, December 15, 2009



ONE PARTNERSHIP. ENDLESS POSSIBILITIES.

60 years ago, India chose to take to the skies with Boeing as its partner. Today this partnership has only grown stronger. Whether it's to deliver a modern fleet to our partner airlines, or offer them solutions from fleet utilization to maintenance and training, the result is greater efficiency and comfort for flyers. As this partnership soars, the possibilities of what it will achieve are, indeed, endless.

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Slipping the bonds

It's not often an all-new Boeing jetliner makes that magical first flight. It happened Dec. 15 when the 787 Dreamliner completed its takeoff roll at Paine Field near Everett, Wash., and lifted off into an overcast morning before an audience of several thousand Boeing employees. They cried, cheered, and pumped fists and arms in the air—and took a lot of pictures. In this issue, *Frontiers* celebrates the 787's first flight with 10 pages of photos taken by employees and by Boeing photographers.

COVER IMAGE: AMONG THE BOEING EMPLOYEES WITH A FRONT-ROW SEAT TO HISTORY AT PAINE FIELD IN EVERETT, WASH., DEC. 15, WAS SCOTT WIERENGA, AN ENGINEER ON THE 787 INTERIORS INTEGRATION TEAM. THIS IS HIS PHOTO OF THE MOMENT WHEN THE 787 DREAMLINER FIRST TOOK TO THE SKY. PHOTO BY SCOTT WIERENGA/BOEING

PHOTO: THE 787 DREAMLINER, WITH ONE OF TWO CHASE PLANES AT ITS SIDE, CLIMBS AWAY FROM PAINE FIELD ON ITS FIRST FLIGHT. KEVIN BROWN/BOEING

Ad watch

The stories behind the ads in this issue of *Frontiers*.

Inside cover:

The "One partnership. Endless possibilities" advertising campaign illustrates Boeing's commitment to success through its partnership with India, a relationship that has existed for more than 60 years. In this ad, the pastime of Pittu, a popular children's game played throughout India, symbolizes the teamwork that has brought the Boeing-India partnership to new heights. It was photographed in Delhi, India's capital, located in the midnorthern region.



Featuring the most popular sport in India, cricket, this ad underscores the strong partnership between Boeing and India with the common goal of ensuring India's safety. The ad was photographed in Ladakh, which lies between the Kunlun mountain range in the north and the main Great Himalayas to the south.

Inside back cover:



This ad shows the traditional Indian competition of boat racing, which symbolizes the use of teamwork and the sharing of common goals. It was photographed in Kerala, which lies to the far southwest of the Indian peninsula.

Back cover:



ABOUT THIS ISSUE

February marks an important change for *Frontiers*. Starting with this issue, the paper on which the magazine is printed will be Forest Stewardship Council-certified. To meet this environmental standard—which Boeing is pushing for on all its printing projects—paper mills and print shops must adhere to strict FSC requirements, from better-managed forests to the handling of chemicals and paper waste.



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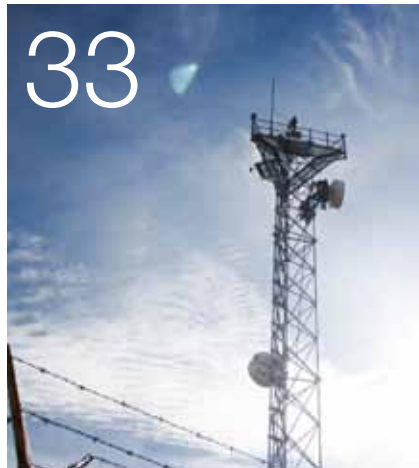
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table of contents



33

Bordering on the extreme

Summer temperatures often soar above 100 degrees Fahrenheit (38 degrees Celsius). Shade is tough to find. And then there is the local wildlife to contend with. Welcome to the home of Boeing employees working on the SBI^{net} program to secure portions of the southern land border of the United States with cameras, sensors and other technology that must be placed atop towers in a remote desert environment. PHOTO: MIKE GOETTINGS/BOEING



36

Where Eagles dare

At a base in Idaho, pilots and ground crews with the Republic of Singapore Air Force are undergoing extensive training to operate and fully harness all the capabilities of Boeing's F-15SG, the most advanced version of the F-15 Eagle. Singapore has ordered 24 of the multi-role Boeing fighters. PHOTO: KEVIN FLYNN/BOEING



45

A function of collaboration

By working together across distances and business units, Boeing engineers are helping the company succeed in ways that would not have been possible only a few years ago. It's all part of a re-emphasis on technical leadership as Boeing further strengthens its Engineering function. PHOTO: ALAN MARTS/BOEING



22 Partnering with India

With a fast-growing economy, middle class and world standing, India is an increasingly important market for the aerospace industry. Building partnerships and strengthening ties with this dynamic country is crucial for Boeing's continued success in the world's second-most populous nation. Although India has been a longtime customer for Boeing's commercial airplanes, Boeing and India have the potential to build a lasting defense partnership, too. PHOTO: GETTY IMAGES



50

Maintaining momentum

Although Boeing recorded numerous successes in 2009 in improving its workplace safety and environmental performance, it's critical to build upon these achievements in the coming year. Mary Armstrong (center), Boeing's leader of Environment, Health and Safety, talks about the company's goals and plans for 2010. PHOTO: RON BOOKOUT/BOEING

INSIDE

06 Leadership Message

A look at the business environment and why employees must focus on supporting the customer and helping the business grow in 2010, from Boeing Chairman, President and CEO Jim McNerney.

07 Snapshot/Quotables

08 Why We're Here

09 New and Notable

10 Historical Perspective

53 Stock Charts

54 Milestones

58 In Focus

Flight plan for 2010

Seven strategies take priority in building Boeing's future

Jim McNerney
Boeing chairman, president and chief executive officer

Boeing finished 2009 on a high note. Despite the difficult market conditions and other challenges we faced, our team's hard work and perseverance ultimately paid off in the form of significant progress on our development programs, solid core business performance and continued financial strength.

While we have clearly turned momentum in our favor, 2010 will be another challenging year for both of our big businesses—and for our customers. Our plan for addressing these challenges and taking advantage of the tremendous growth potential we see ahead includes these seven strategic priorities:

1. Deliver on our development programs, particularly the breakthrough 787. We're seeing solid progress across the board on our development programs, including the 787 Dreamliner. This airplane represents about 40 percent of our total backlog. Certifying it and ramping up deliveries to customers will have a major positive impact on our cash flow and ability to continue investing in other growth projects. The team has made great progress, but there is much work to be done this year.

2. Speed up repositioning of our defense business and extend existing programs. Boeing Defense, Space & Security has a strong set of core businesses in military airplanes, rotorcraft, communications networks and satellites, services, and more. Expecting tighter defense budgets and changing customer priorities, we began repositioning this business a few years ago with investments in new areas like unmanned systems, intelligence and surveillance, and cybersecurity. Last year's big shift in U.S. defense priorities reaffirmed our direction and signaled we must further speed our repositioning.

3. Expand our international advantage. Our international relationships, reputation and experience are big competitive advantages. We must continue capitalizing on them by addressing global market opportunities as one company with in-country teammates who broaden and deepen our relationships with governments, technology centers and industry partners. Successes here are on the rise, but we've only scratched the surface of how much we can achieve.

4. Leverage and grow our services businesses. Our focus here is on both extending existing lines of business (such as spare parts, supply chain management, maintenance and overhaul, and



modifications and upgrades) and moving into adjacencies that require intricate management of information-technology-related networks (such as large logistics organizations, security and energy grids). Our commercial and defense services businesses have worked well to reduce costs and integrate acquisitions that are contributing to our current results while sowing seeds of growth that will flourish when today's struggling markets revive.

5. Drive innovation through focused enterprise research and development. We are aligning our technology investments companywide and sharing the results of that investment across the enterprise. These efforts are all about growth and productivity, and efficiently and effectively investing our money to achieve them. A "One Boeing" approach to planning and setting investment priorities is among the keys to this effort, as is strengthening the role of Boeing Research and Technology, our central research arm.

6. Aggressively manage our financial strength. Until we begin delivering 787s and 747-8s in meaningful numbers (which we expect to happen in 2011) we need to maintain our 2009 intensity for managing our financial health. That means executing to plan on our development and production programs, driving new and replicating existing ideas for improving productivity, and managing our discretionary and capital expenses to free up cash for smart investment in growth opportunities.

7. Empower and deploy a new generation of leaders. We have the best team in the industry. Our goal is to develop an even better one for the future. We have proactively moved promising leaders into key positions based on how well they perform their jobs and live our Leadership Attributes, and we will continue to develop and promote leaders on this basis, stretching ourselves to make Boeing a better company with each passing day.

Executed well, these strategies will lead to a more prosperous future for Boeing, employees, our customers and the communities we support around the world. None of it will be easy—that's for certain. But I believe we have the plan, the resources and the people to get the job done, and thereby ensure our continued leadership of this exciting and meaningful industry. ■

PHOTO: BOB FERGUSON/BOEING



HEAVY LIFTING FOR HAITI

Boeing's C-17 Globemaster III has been a mainstay of the lifesaving humanitarian missions to Haiti after last month's devastating earthquake. Many of those flights have originated at Charleston Air Force Base in South Carolina, which is home to 54 Globemaster IIIs. In this night shot at the base, U.S. Air Force Technical Sgt. Robert Mabry, a reservist Loadmaster with the 317th Airlift Squadron, 437th Air Mobility Wing, conducts preflight checks on a C-17 leaving for Haiti. Air Force Capt. Patrick Woodall, a C-17 pilot at Charleston who has flown missions to Haiti, said of the heavy-lift transport: "This is a great plane. Its versatility and capabilities were designed for a mission like this. We have flown relief efforts around the world, but Haiti has become a global cause and we are proud the C-17 is playing such an important role in helping so many people." U.S. AIR FORCE

"It was really cool to say, 'You bet. We are airborne today!'"

— Mike Carriker, 787 chief pilot, in response to radio calls from other air traffic in the area while piloting the 787 Dreamliner's first flight on Dec. 15, as reported in the post-flight press conference. The story and employee photos of that historic day begin on Page 12 of this issue of *Boeing Frontiers*.

"I was born to fly a C-17."

— Lt. Gen. Robert R. Allardice, commander of the 18th Air Force, as he accepted delivery of the U.S. Air Force's 192nd C-17 Globemaster III in December at Boeing's Long Beach, Calif., factory, as told to Boeing News Now.

IAM PROMOTIONS

No promotions listed for periods ending Dec. 4, 11, 18 and 25, and Jan. 1, 8, 15 and 22.

ETHICS QUESTIONS?

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The power of the network

Helping solve problems as a team is one of the most rewarding parts of this Boeing employee's job

by Junu Kim and photo by Marian Lockhart



As an Associate Technical Fellow with the Network Services organization in Boeing Information Technology, Joshua Taylor works with teams from across the company. In this *Frontiers* series, which profiles employees talking about their jobs and the ways their work fits into Boeing's overall goals, Taylor, a co-recipient of a Boeing 2009 Special Invention Award, explains why every day is different—and why teamwork matters.

For me, there's no such thing as a typical workweek—I always have a variety of things going on. I'm lucky because I've been involved in so many different projects. Some have been with Boeing Commercial Airplanes and some with Boeing Defense, Space & Security. I also perform troubleshooting for the Network Services organization.

Some days I might be doing testing for a program, like the Labnet group in AMSE (the Analysis, Modeling, Simulation and Experimentation organization within BDS). But in the next hour, I might get a call from a flight-test team and work on requirements for an airplane's data recorder.

The best days are when I'm asked to help on a problem and I can get it solved quickly. When you solve a problem, you get immediate feedback. It's rewarding to know that my work helps other people do their jobs.

Information Technology systems are so important to business today, and networking is at the core of everything. You definitely see how the work we do in Network Services affects productivity. For example, Boeing has a lot of partners around the world who

need to connect to us, and we have to make sure they can get the data they need in a timely manner. Our networks let us work better and smarter. There's a lot of business value in that.

I'm very proud to have been on a team that won a Special Invention Award*. Being at the award event in September 2009, among so many talented people, filled me with awe. When you work as a team, you get more accomplished.

Teamwork is an important part of Network Services. I get to work with people from around the company and across the world to come up with the right solutions. Boeing really values teamwork. One person can accomplish a little, but as a team your achievements grow exponentially. ■

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*Joshua Taylor and teammates James Farricker, Garry Herzberg and Paul Stout received a Boeing Special Invention Award in September for their work developing a computer router that establishes connectivity between a client device and an airplane's onboard systems.

3,133 ... and counting

With employees and partners focused on efficiency, the Next-Generation 737 continues to set records

Late last year, Boeing built its 3,133rd Next-Generation 737, surpassing the production of all previous 737 models combined. Boeing employees in Renton, Wash., needed just 12 years to reach this milestone; a focus on efficiency by employees and suppliers has cut final assembly time of the 737 by more than half—to 10 days. It took 32 years to produce the same number of earlier-model 737s.

Shortly after delivering the first Next-Generation 737 in 1997, Boeing employees and suppliers began the journey to continuously improve the airplane and to produce it more efficiently. As a result, Next-Generation 737s are lighter, consume less fuel and generate fewer emissions than their predecessors, and they are more economical to operate and maintain. Indeed, 737s delivered between September 2008 and September 2009 had so few technical issues in service their passengers left the airport gate on time 99.8 percent of the time.

Over the next few years, passengers will enjoy the new 737 Boeing Sky Interior and Boeing will incorporate changes that reduce fuel consumption and emissions by another 2 percent.



PHOTO: In December, Brazil's GOL Airlines took delivery of these two Next-Generation 737s, including the record-setting 3,133th model produced. GOL celebrated nine years of commercial service on Jan. 15. Its fleet has grown from six airplanes to 109, all of them Next-Generation 737s. JIM ANDERSON/BOEING

The stuff of legends

How well do you know some of the best and brightest engineers who have worked for Boeing?

National Engineers Week, which takes place Feb. 14–20 in the United States, celebrates engineers and their accomplishments. For The Boeing Company, those accomplishments have been many, including helping make it possible to send astronauts to the moon and return them safely to Earth.

In honor of National Engineers Week, *Frontiers* presents this short quiz about some of the legendary engineers who have worked for Boeing and its heritage companies. Match the name on the left with the achievement on the right. Answers are below.

For more about engineering excellence at Boeing, see Page 49.

Engineer	Accomplishment
1. Lee Atwood	A. Was instrumental in the design Douglas airplanes such as the DC-1, DC-2 and DC-3
2. Herman Barkey	B. Brought the swept wing to Boeing
3. Ed Heinemann	C. Led the team that developed Syncom, the world's first geosynchronous satellite
4. Arthur Raymond	D. Designed the B-17 and had a hand in the design of every Boeing airplane up to the 767
5. Harold Rosen	E. Was chief designer of the P-51 Mustang
6. George Schairer	F. Was director of engineering for the 747 program
7. Ed Schmued	G. Was instrumental in designing the P-51 Mustang, the X-15 rocket plane and the Apollo Command Module
8. Joe Sutter	H. Was a pioneer member of the F-4 Phantom engineering team
9. Ed Wells	I. Provided major design and leadership on Project Mercury and Gemini
10. John Yardley	J. Led the design of famous Douglas tactical aircraft from the SBD Dauntless to the A-4 Skyhawk; awarded the Collier Trophy in 1953

Answers: 1-G, 2-H, 3-J, 4-A, 5-C, 6-B, 7-E, 8-F, 9-D, 10-I

Those magnificent men...

A 1910 air show found Bill Boeing looking for a ride in the sky—and discovering a passion by **Mike Lombardi**



For Bill Boeing, it began with an air show near Los Angeles and the discovery of a passion for aviation—the hallmark of the company that he founded six years later and that still bears his name.

The year was 1910, and Boeing's first exposure to airplanes was at the Los Angeles International Air Meet, the first of its kind in the United States. Held at Dominguez Field, near present-day Compton, it featured some of the day's pioneering aviators, including Glenn Curtiss and France's Louis Paulhan.

The 11-day event, which began Jan. 10, attracted over 20,000 people each day, with more than 250,000 tickets sold, including several to 29-year-old William "Bill" Boeing. Impressed by Paulhan and his Farman biplane, Boeing tried to get a ride with the French aviator. But it was not to be, and Boeing left disappointed. Paulhan probably left Los Angeles feeling worse—receiving news he was being sued by the Wright Brothers for patent infringement.

“There isn't much to that machine... I think we could build a better one.”

— William E. Boeing, founder, The Boeing Company

PHOTO: Aviators who participated in the Los Angeles Air Meet. In the center is French Aviator Louis Paulhan, from whom Bill Boeing unsuccessfully tried to get a flight. BOEING ARCHIVES



Nine months after the air meet, at a similar event held on the other side of the country in Belmont Park, N.Y., U.S. Navy Lt. Conrad Westervelt discovered the same urge to fly. Their paths would soon cross when Westervelt was introduced to Boeing at Seattle's University Club. The two men found they shared a number of interests, including a passion for aviation.

Boeing and Westervelt began to look for any opportunity to fly, and on July 4, 1914, their quest was realized when pilot Terah Maroney brought his Curtiss floatplane to Seattle's Lake Washington. After a flight, Boeing told Westervelt: "There isn't much to that

machine of Maroney's. I think we could build a better one." To that, Westervelt replied: "Of course we could."

Together, Boeing and Westervelt did build a better one, a plane named with their initials—the B&W. It was the first in a line of innovative, pioneering commercial, military and space vehicles that have defined aerospace and helped change the world. ■

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PHOTOS: (Clockwise, from top left) Large crowds came daily to see the Los Angeles air show; Conrad Westervelt, co-designer of the first Boeing plane; a Martin TA (shown here taxiing on Lake Washington in Seattle) purchased by Bill Boeing—the plane inspired the design of the first Boeing airplane, the B&W; William Boeing. BOEING ARCHIVES

Dream flight

First flight of the 787 was a time of high emotions for the 787 team and Boeing employees around the globe, captured here in pictures **by Lori Gunter**



Of the thousands of Boeing employees who were there to watch the 787 take off for the first time, many took pictures, with cameras and cell phones held high. Some of these images are included in this photo essay, among others by Boeing photographers.

PHOTOS: (Below) Thousands of Boeing employees watch the first 787 Dreamliner lift off Dec. 15 from Paine Field in Everett, Wash. DAVID QUERUBIN/BOEING
(Inset) Some employees dressed up for the occasion. DANIEL THOMPSON/BOEING

More than 13,000 Boeing employees braved cold and wind to witness the takeoff of the first Boeing 787 Dreamliner Dec. 15 from Paine Field in Everett, Wash. Another 81,000 Boeing computers logged on to the event online, in some cases a single computer providing the feed that hundreds watched in remote locations. Thousands more employees turned out to watch the airplane land at Boeing Field in Seattle just over three hours later. And in a small corner of the Everett facility, 100 children at the Boeing Family Center watched from the playground.

The interest extended well beyond Boeing. Program partners held viewing events for their workers, and Boeing's external Web

page received more than a million hits during takeoff and a million more after the event. Viewers logged on from every continent, including Antarctica.

There was even interest from above. While Capt. Mike Carriker and co-pilot Randy Neville flew the 787, commercial airline pilots approaching and departing Seattle's SeaTac International Airport radioed their congratulations.

"They would come over the radio to us or to air traffic control, 'Is that the Dreamliner? Is she airborne? Way to go!' It was really great and really gave us the feeling of just how many people were rooting for Boeing to get the Dreamliner airborne," Neville said.

But emotions ran no higher than with the men and women



who support the program at Boeing.

"Seeing [the airplane] take to the air and knowing Boeing did it again made it the proudest day of the year for all of Boeing," said Sharon O'Hara, executive office administrator for the leaders of the 787 System team. "I had goose bumps and tears. We said we would do it and we did!"

As Tony Blackner watched the airplane fly away, he thought it "amazing" that it looked just like the simulation videos.

"Years of technology development, model-scale testing, full-scale testing, consultations, discussions, meetings and changes culminated in this airplane," said Blackner, senior manager of Environmental Performance on the 787 program.

Dave Trop, deputy chief structures engineer for the 787 team, noted that when the wheels of a new airplane leave the ground for the first time, it is "a very satisfying moment ... a big sense of relief that it's finally an airplane instead of a 'bus with wings.'"

When the 787 took off, Trop added, "There was an immediate lift in morale."

Todd Harless was part of a team that had to stand by at the Airplane Energy Management lab across the street from Boeing Field. Had there been any energy management problems in flight, the team would have worked to re-create them and find a solution in the lab.

"I remember thinking back through the years of hard work and travel we all had to go through to finally get to this one moment of watching our aircraft touch down in Seattle and show us that all of that work had paid off," Harless said.

Cory Goulet has been working on the 787 program for nearly six years. For her, and many others, first flight provided a moment to both look back at what it took to get to the milestone and look forward at what is to come. "It was just pure excitement and joy seeing the 787 in the air," Goulet said. "I feel very fortunate with the opportunities I have had here and feel pride knowing I am on the 787 program."

Before the airplane took off, Stephen Dame started a recorder that logged the control and command events within the 787 power system. After it landed, he went on board to retrieve the data.

"It was a peak Boeing career experience to have an important duty ensuring that all of the power systems, developed by my Boeing colleagues and supplier counterparts, would be accurately recorded by a system I helped to develop over the past couple of years," Dame said. "I'm sure that first flight day will take on even more significance as it blends into the history of the accomplishment of all of the people involved in this program," he said.

For Jim Terrell, an instrumentation lead who was to begin work on the airplane as soon as it landed at Boeing Field, it was "a very long journey to get the airplane flying. To be involved in such aviation history is a once-in-a-lifetime event. The 787 airframe is a leap in technology that is on par with the 707 and the 747," Terrell said. "The testing that will occur over the next year will be very exciting."

Testing resumed within days of first flight and is planned to continue through most of 2010 using six airplanes. ■

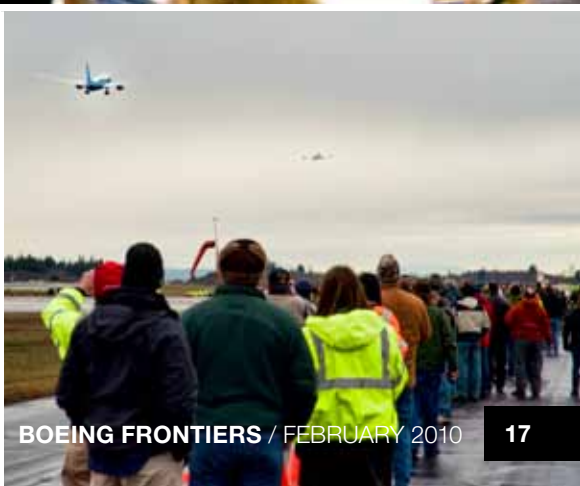
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PHOTOS: (Below) Test pilots Mike Carriker, left, and Randy Neville wave to employees and family as they board the 787 for its first flight. JIM ANDERSON/BOEING

(Insets, from top right) The flight-test crew conducts last-minute checks the morning of first flight. JOHN HELLRIEGEL/BOEING Volunteers check for foreign object debris before engine start. MARIAN LOCKHART/BOEING Test pilots Mike Carriker, right, and Randy Neville perform their preflight inspection. MARIAN LOCKHART/BOEING Everett flight-line employees take photos of the airplane as it is readied for flight. STEVE GROHS/BOEING All eyes are on the 787 as it begins its taxi roll. KEVIN BROWN/BOEING



PHOTOS: (Below) A view from the crowd as the 787 Dreamliner takes off. **RUSSELL ROCKWOOD/BOEING**
(Insets, from left) The 787 taxis to Paine Field runway 34L for takeoff. **DAVID YAMAMOTO/BOEING**
 Boeing employee David Guo marks history. **BOEING** Family members of the pilots wave as the plane taxis past. **MARIAN LOCKHART/BOEING** Members of the media get ready to record history. **GAIL HANUSA/BOEING**
 Among the onlookers, Jim McNerney, Boeing chairman, president and CEO, cheers at liftoff. **MARIAN LOCKHART/BOEING** Accompanied by a chase plane, the 787 climbs to altitude and starts its flight-test program. **JOHN PETERS/BOEING**





PHOTOS: (Left) A triumphant Mike Carriker, 787 command pilot, exits the Dreamliner after the first flight. JOHN HELLRIEGEL/BOEING **(Insets, from top left)** The 787 lands at Boeing Field in Seattle. DAVID ROSENQUIST Ground crew approach the airplane after landing. DAVE HUTSELL/BOEING From left, Trevor Maxfield, Slade Bedford, Caroline Fitzpatrick and Leslee Brown were some of the Boeing employees on hand for the airplane's arrival at Boeing Field. KRISTIN KOON/BOEING Test pilots Mike Carriker and Randy Neville greet family and others after landing. JIM ANDERSON/BOEING A press conference with the test pilots. MARIAN LOCKHART/BOEING Boeing employee Eric Edwards in front of the 787 after its successful first flight. CHAD PTAK-DANCHAK/BOEING

“Twenty years from now I believe that rainy day ... will be viewed as one of the most important in the history of this company and commercial aviation. It ... will always be remembered as a day that fundamentally changed the way airplanes are built and how people travel. And it will be seen as a day when Boeing once again proved the kind of company it is: a company of vision and achievement—a company that does great things.”

— Jim Albaugh, chief executive and president, Boeing Commercial Airplanes



PHOTO: A few days after first flight, Dreamliner ZA001 was in the air again, shown here over downtown Seattle on approach to Boeing Field. LEO DEJILLAS/BOEING

Rising star

“Boeing recognizes that to be global, a company must be local. We must have a strong country presence complemented by a deep understanding of local culture, history and government.” – Shep Hill, president of Boeing International



Building a strong relationship with India is crucial to Boeing's growth in this dynamic country by Eric Fetters-Walp

Workers in Bangalore are researching better ways to build airplanes out of cutting-edge composite materials. A manufacturing plant in Nagpur is gearing up production of floor beams for the 787 Dreamliner. From a runway at Kolkata's airport, a Next-Generation 737-800 operated by Air India Express departs on a flight.

Boeing has many expanding roles in India—as a research and manufacturing partner, a customer of Indian companies, and a supplier of commercial jetliners and military aircraft. Above all, Boeing is looking to grow its wide-ranging presence in this dynamic nation.

To accomplish that, the focus is on partnering with India's private industry and government, said Shep Hill, president of Boeing International.

“Boeing recognizes that to be global, a company must be local,” he said. “We must have a strong country presence complemented by a deep understanding of local culture, history and government. Boeing is continually exploring new business and investment opportunities, as well as potential research and development partnerships, in India,” he said.

Dinesh Keskar, president of Boeing India, underscores that message: Building strong partnerships with India is crucial to Boeing's growth there. There is good reason to be involved in India, Keskar said. It has re-emerged as a global economic power in the past two decades.

“With its economy of \$1.2 trillion, huge middle class and continued growth in discretionary income, India looks to be a very strong market for a long time,” he said.

Economic strength isn't new to India. Dating back to ancient times, India was a bustling center of trade. By the second half of the 18th century it boasted the world's second-largest economy. A recent report from U.S. investment bank Goldman Sachs predicts India's gross domestic product will exceed the United

States' GDP by the middle of this century, making India again the No. 2 economic power in the world, behind only China.

Boeing's biggest opportunities in India historically have been tied to the civil aviation there. That especially has been true in recent years, as India's liberalized airline industry began expanding by leaps and bounds.

In 2006, Air India placed India's largest single commercial airplane order ever with Boeing, for 68 airplanes with a value of \$11 billion. And an ever-growing middle class with the means to travel and the rise of discount-fare airlines will continue to drive India's need for airplanes.

As India's commercial aviation sector continues to expand, it creates opportunities for the country's nascent

aircraft financing industry, an area being nurtured by Boeing's aircraft financing unit, Boeing Capital Corporation.

BCC has actively helped connect Indian airlines with capital sources to support their deliveries through roundtable sessions with commercial banks. It has also provided customers such as Air India and Jet Airways with assistance in tapping the loan guarantee resources of the Export-Import Bank of the United States.

“Where our Indian customers are now typically sourcing financing for their deliveries from international banks, growth will mean more financing coming from Indian banks,” said Anil Patel, BCC's senior financing director for the region.

Even as Boeing continues to compete on the commercial side, India has opened

up in recent years as a potential customer of defense products. That's a major opportunity for Boeing, according to Keskar. India used to purchase much of its military aircraft from firms in Russia and Europe. Just over three years ago, however, then-President George W. Bush and the U.S. Congress agreed to share technology with India for its civilian nuclear power industry. That agreement, along with closer strategic ties between the two nations, allowed U.S.-based defense firms to compete for India's business.

PHOTOS: (Left) In 2006, Air India signed the country's largest airplane order ever for 68 Boeing jetliners, including 777-200LRs such as the one shown here. **WILL WANTZ/BOEING (Above)** A Boeing C-17 at the Aero India 2009 air show. **BRIAN NELSON/BOEING**

India

at a glance

Formal name: Republic of India
Location: Southwest Asia, bordering Pakistan, Myanmar, China, Bangladesh, Bhutan, Nepal, the Arabian Sea, and the Bay of Bengal and Indian Ocean
Area: 1,269,221 square miles (3,287,267 square kilometers), about one-third the size of the United States

Population, 2009: 1.17 billion people; ranked second worldwide
Capital: New Delhi
Other major cities: Mumbai, Bangalore, Kolkata, Chennai and Hyderabad
Major languages: English, Hindi, Bengali, Telugu, Marathi, Tamil and Urdu; India has 26 official languages

Gross domestic product, 2008: \$1.2 trillion; ranked 12th worldwide
GDP growth rate, 2008–2009: 6.7 percent
Largest export partners in 2008: United States, China and United Arab Emirates

Sources: World Bank, Embassy of India, U.S. government, Planning Commission of India

India's gross domestic product will exceed the United States' GDP by the middle of this century. — A June 2008 Goldman Sachs report

Indeed, India last year ordered eight P-8I long-range maritime reconnaissance and anti-submarine warfare aircraft for the Indian navy. The \$2 billion order made India the first international customer for that new aircraft. Overall, defense opportunities for Boeing in India during the next decade total nearly \$31 billion.

Matching India's potential as a customer, however, is its reputation as a nation with vast intellectual capital. With a heritage steeped in engineering and mathematics, India ranks among the world's top five nations in residents holding doctorate degrees. The nation's aerospace sector dates back to the first half of the 20th century, and its ambitious space program has a goal of reaching the moon with a manned mission in the next decade.

With these distinctions, it is not a surprise that Boeing chose India as the location for its newest research institute outside the United States. The Boeing Research & Technology-India center opened last year in Bangalore, also known as Bengaluru, to serve as the focus for all Boeing research and development activities in India.

The center is focused on developing new materials, processes and software, as well as other technologies, in collaboration with Indian companies, universities and government laboratories. Boeing's research team in India, consisting of a small number of researchers, scientists and engineers, helps align the technology requirements of Boeing business units with technology opportunities and capabilities in India.

"India has a great deal of technological expertise, particularly in such areas as metallurgy and materials science," said Bala Bharadvaj, director at BR&T-India. "We are learning from [India] and working to assimilate promising new ideas and processes that are being developed here into Boeing products. The people in India are also learning from us,



"With its economy of \$1.2 trillion, huge middle class and continued growth in discretionary income, India looks to be a very strong market for a long time."

— Dinesh Keskar, president of Boeing India

which is helping them further grow their research capabilities to meet the emerging needs in-country."

In addition to the technology center, Boeing has a five-year relationship with the Indian Institute of Science in Bangalore, with a focus on development of advanced materials and structures and manufacturing technologies. Boeing also has partnered with a few other Indian universities for

additional research and development.

These partnerships with Indian academic institutions and companies not only advance Boeing's technology but also

PHOTO: Dinesh Keskar, president of Boeing India, with a Next-Generation 737-800 recently delivered to Air India Express. The airplane is the 17th 737-800 delivered to Air India and its affiliates in the past four years. JIM ANDERSON/BOEING

bolster its presence and reputation there, according to Hill. "The Indian government sees the commitment Boeing brings to India and the value of work we're bringing to the people," he said.

The partnership strategy also epitomizes how Boeing operates in India, Hill said. "If you look at India, we went in there with a company structure to work as 'One Boeing.'

"We are working together well, and when we work together, we are extremely competitive in the market," Hill said.

Indeed, part of the reason Boeing is well-positioned in India is due to the groundwork it has done over the past decade to establish itself as a preferred partner for Indian industry, universities and government organizations, according to Keskar. While the investments made in India help Boeing meet work placement requirements that come with orders, there are many other benefits: access to new research, more and better supplier relationships with Indian firms, and growing demand for the products and services in which Boeing specializes. And that supports jobs not only in India but also in the United States.

Boeing also is partnering with India as a responsible business leader and citizen, Keskar said. Following the Indian government's focus on education and health, Boeing's Global Corporate Citizenship organization is working with nongovernmental organizations to accelerate progress in these areas.

"We've been successful on the commercial side, and we've been successful on the defense side," Hill said. "We have more work to do, but I'm extremely proud of what we have done—and the results speak for themselves, demonstrating that partnerships and creating shared value can result in bottom line growth and productivity." ■

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"We are learning from [India] and working to assimilate promising new ideas and processes that are being developed here into Boeing products."

— Bala Bharadvaj, director, Boeing Research & Technology-India

PHOTO: Richard Lomax, Asia Pacific Supplier Quality team leader for Boeing Defense, Space & Security (left), inspects production work on an F/A-18 gun bay door at Hindustan Aeronautics Ltd.'s Aircraft Division with V.G. Shygi, Jadi Tukaram and (kneeling) Latte Padmaraj. HAL

India's major airlines

Air India, Air India Express, Air India Cargo and Alliance Air
Headquarters: Mumbai
Fleet: 165 airplanes, including 21 777s, seven 747s, 25 Next-Generation 737s, five 737 Classics and six 737 Freighters and Combis, as well as Airbus, Bombardier and ATR models. Air India Express operates 25 Next-Generation 737s.
Notable: Air India, the national flag carrier, also has 27 787 Dreamliners on order.

Jet Airways, JetLite and Jet Airways Konnect
Headquarters: Mumbai
Fleet: 112 airplanes, including 69 737s and Next-Generation 737s, 10 777-300ERs, as well as Airbus, Bombardier and ATR models. JetLite's fleet of 23 airplanes includes 16 737s and Next-Generation 737s.
Notable: Jet Airways ended 2009 with the largest domestic market share among India's airlines.

SpiceJet
Headquarters: Delhi
Fleet: This five-year-old discount carrier flies an all-Boeing fleet of 19 737-800 and 737-900ER airplanes.

Kingfisher Airlines and Kingfisher Red
Headquarters: Bangalore
Fleet: 70 airplanes, all Airbus and ATR models
Notable: Founded in 2005, Kingfisher

holds the second-largest domestic market share among India's airlines.

IndiGo
Headquarters: Gurgaon
Fleet: This discount carrier flies 24 Airbus A320-200 airplanes.

Other Indian passenger and cargo airlines include GoAir, a discount carrier launched in 2005, which flies only Airbus A320s; Blue Dart Aviation, which operates a cargo fleet

of eight 737 Freighters and 757 Freighters; Paramount Airways, which flies Embraer airplanes; Deccan 360, which operates three A310 Freighters; and MDLR Airlines, which uses smaller regional jets.

Flying high

Boeing airplanes have helped lay the foundation for civil aviation in India **by Bill Seil**



“India is a terrific market for Boeing with a strong customer base. It is one of the largest, long-term growth areas in the world for commercial aviation.”

— Marty Bentrott, Commercial Airplanes' vice president of sales for the Middle East, Central Asia and India

India has been using Boeing products since World War II, when it acquired DC-2 and DC-3 airplanes. In 1960, Air India purchased its first Boeing 707, one of many company jetliners the airline would add to its fleet.

In 1991, India bought four 747-400s valued at \$690 million from Boeing, an order that was seen as a milestone for Boeing in its relationship with India's commercial aviation. And in 2006, Air India placed with Boeing the single largest commercial airplane order in India's civil aviation history—68 airplanes with a combined value of more than \$11 billion.

Air India, along with two other Indian carriers, Jet Airways and SpiceJet, today operate Boeing twin-aisle and single-aisle airplanes to provide domestic, regional and international passenger service. Boeing's 2009 Current Market Outlook projects India will need 1,000 new passenger airplanes and freighters over the next two decades.

“There is strength and resilience in India's commercial aviation sector over the long term,” said Dinesh Keskar, president, Boeing India, who led Commercial Airplanes' sales in India

from 1987 until February 2009. “The potential for future growth of air travel, both domestically and internationally, is vast.”

Marty Bentrott, who was named Commercial Airplanes' vice president of sales for the Middle East, Central Asia and India early last year, cited some of the reasons for India's importance to Boeing and commercial aviation as a whole.

“India is a terrific market for Boeing with a strong customer base,” Bentrott said. “It is one of the largest, long-term growth areas in the world for commercial aviation. It has a large population with a growing middle class. Our forecasts show the demand for air travel will continue to increase.”

Air India, India's government-owned flag carrier, based in Mumbai, has a fleet of 28 Boeing airplanes, including 747s and 777s, and offers international, regional and domestic service. It has an additional 33 Boeing airplanes on order, including 27 787 jetliners and six 777-300ERs. Air India's low-cost subsidiary, Air India Express, operates 25 737-800s.

Jitender Bhargava, Air India's executive director of Corporate Communications, said Air India has attained several milestones

with Boeing airplanes. In May 1960, it used Boeing 707s to become the first Asian carrier to fly across the Atlantic. Boeing 747s helped the airline to expand its network by opening long-haul operations on high-density routes. It recently began flying 777 jetliners nonstop from New Delhi and Mumbai to New York.

“Boeing aircraft have, in fact, helped Air India in laying the foundation of civil aviation in India,” Bhargava said.

Boeing is committed to a number of airline support initiatives in India, including investing \$100 million in a commercial airplane maintenance, repair and overhaul (MRO) facility as well as commercial aviation training. Boeing is working with Air India to establish the MRO facility in Nagpur. The company also is supporting

Air India in the development of a training center and providing 787, 777 and Next-Generation 737 flight simulators.

In addition, Boeing is assisting Air India in conducting an operational audit, which is evaluating the airline's flight operations, maintenance programs and engineering services. The audit will result in recommendations to improve Air India's overall operations. Where appropriate, it will identify Boeing products and technologies that would enhance operational efficiency.

Jet Airways, also based in Mumbai, is one of several privately owned airlines formed in the early 1990s. It has been a Boeing customer since its early days when, after a challenging competition with Airbus, the airline purchased 737 Classics. It has since gone on to fly Next-Generation 737

and 777 airplanes, offering international, regional and domestic service. Sixty-three of its current fleet of 89 airplanes are made by Boeing. It has 32 Boeing airplanes on order, including 10 787s, two 777s and 20 Next-Generation 737s. JetLite, the wholly owned low-cost subsidiary of Jet Airways, currently operates 16 737s and Next-Generation 737s and has nine additional 737-800s on order.

SpiceJet, a privately owned airline based in New Delhi, is predominately a domestic carrier operating with a fleet of

PHOTOS: (Left) The vertical fin of an Air India Express 737-800. **JIM ANDERSON/BOEING**
(Top) A Jet Airways 777-300ER. **TIM STAKE/BOEING**
(Above) A SpiceJet Next-Generation 737. **JIM COLEY/BOEING**

Partners in flight

Boeing's presence in India dates back almost 70 years, to the days of the twin-propeller DC-2 manufactured by heritage company Douglas Aircraft Co. Tata Airlines, which later became Air India, began flying two DC-2s—on loan from the Indian government—in 1941 on flights between India and the Middle East.

A year later, the airline began flying the Douglas DC-3, which became the mainstay of Air India's fleet in the 1940s. And in 1960, Air India entered the jet age with its first Boeing 707.

Since then, Air India has been an important Boeing Commercial Airplanes customer, operating 747s, 777s and 737s.

In 2006, Air India and Boeing signed an order agreement for 68 Boeing jetliners, the

single largest commercial airplane order in India's history. It includes 27 787 Dreamliners.

Over the past 15 years, India's newer airlines also have become notable Boeing customers, including SpiceJet, which operates an all-Boeing fleet of Next-Generation 737s. Jet Airways has ordered 10 Dreamliners.

— Eric Fetters-Walp

19 Next-Generation 737 airplanes. It has nine more Next-Generation 737s on order.

Boeing and SpiceJet are developing an integrated materials management program in which Boeing will provide the full scope of supply chain management for the airline's maintenance program. This will allow SpiceJet to reduce costs and focus more attention on serving its passengers. The initiative makes use of products and services offered by Boeing Commercial Aviation Services.

India also is a strong market for Boeing Business Jets. Three BBJs are owned by the Indian Ministry of Defense for head-of-state and VIP missions. In addition, some BBJs are privately owned. As the number of wealthy individuals continues to grow in the country, there is an excellent outlook for future BBJ sales.

Boeing also is committed to developing the country's aerospace supply base. Larry Coughlin, managing director, India Operations, for Commercial Airplanes, is working with Indian businesses to coordinate their involvement in Boeing airplane programs. Based in New Delhi, Coughlin works in support of the "One Boeing" strategy and is earning India's trust in the Boeing enterprise.

"India isn't immediately thought of as a manufacturing center, when compared with other countries," Coughlin said. "But people need to see what's going on here. With its young and talented work force and strong growth in the manufacturing sector, India is changing rapidly."

Commercial Airplanes also is using Indian companies for engineering services and information technology projects.

Carl Brandenburg, vice president, Middle East, Africa and South Asia, for Boeing Commercial Aviation Services, said the company opened its first Field Service office in Mumbai in 1960. Today, there are eight representatives at bases in Mumbai and New Delhi supporting approximately 180 aircraft. There also is a dedicated Spares manager



"Boeing aircraft have helped Air India in laying the foundation of civil aviation in India."

— Jitender Bhargava, Air India's executive director of Corporate Communications

in India who acquires parts from company spares centers in the region.

Commercial Airplanes subsidiaries with offices in India include Jeppesen, which offers a portfolio of products and services to enhance operations and navigation, and Aviall, which provides supply chain management products and services. Airlines in India have purchased a number of Boeing products and services that

enhance operations, including Airplane Health Management, Electronic Flight Bag and Maintenance Performance Toolbox, as well as spares-related offerings. ■

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PHOTO ILLUSTRATION: An Air India Express 737 flies over India Gate, one of India's largest war memorials, located in New Delhi. BRANDON LUONG/BOEING

"I believe the U.S., Boeing and India have the potential to build a great and lasting defense partnership. And one of the greatest symbols of that partnership can be the Super Hornet." — Chris Chadwick, president of Boeing Military Aircraft

Building on trust

India's defense modernization drive represents major opportunity for Boeing by Brian Nelson



Soon after Boeing India was incorporated in 2004, Boeing Defense, Space & Security executives went to work opening the once off-limits Indian defense market for Boeing.

"Our first trip in-country was to Aero India air show in 2005," recalled Jerry Vincent, who was assigned business development responsibilities for the F/A-18 Super Hornet in India. With him was Mark Kronenberg, today the vice president of International Business Development for BDS.

"Things were starting to move fast," said Kronenberg. "The U.S. State Department had just greenlighted U.S. defense contractor sales to India, and at about the same time, India issued a Request for Information for 126 new multi-role combat fighters."

To the handful of companies in the world building combat fighters, the India competition promises to be one of the biggest international fighter purchases in decades. But Boeing was not among the companies sent the initial information request. That's because few in India, even in the Ministry of Defense, regarded Boeing as a defense company, which made the work of Vincent and Kronenberg all the more pressing.

"The Indian Air Force was glad that Boeing, known for its quality in commercial airplanes, also had a defense arm and created products like the F/A-18 Super Hornet," said Vincent, who, along with Kronenberg, scrambled to get Boeing a seat at the bidder's table. Yet, their initial meetings with the Defense Ministry and IAF would not have happened were it not for the six-decade legacy of trust already established in India by Boeing Commercial Airplanes.

"How could I not meet with The Boeing Company?" the chief of the Indian Air Force is reported to have said as he welcomed Chris Chadwick, now president of Boeing Military Aircraft, into his office weeks later.

Boeing executives realized that to succeed in India, the company had to present one face to the customer that simply said "Boeing." Internally, this "One Boeing" approach reached across intra-corporate boundaries to capitalize on talent, technology and

PHOTO: The F/A-18 Super Hornet, shown here at Aero India 2009, is a contender for India's fighter competition. KEVIN FLYNN/BOEING

“In this new world, partnerships are the only way to go, and we’re building them.” – Vivek Lall, vice president and India country head for Boeing Defense, Space & Security

expertise across the enterprise.

In line with this strategy, BDS brought in someone with a solid background of Commercial Airplanes experience to lead its initiatives in India. That was Vivek Lall, who now is responsible for promoting the F/A-18 Super Hornet and other BDS defense products in the Indian defense market.

That early strategy is working.

- In 2009, Boeing won the biggest U.S. defense deal with India with the multi-billion-dollar sale of the eight Boeing P-8I long-range anti-submarine aircraft, with more sales possibly on the way. Although a BDS product in name, the P-8I is a derivative aircraft based on Boeing’s 737 passenger aircraft, which Lall knew from his Commercial Airplanes days.
- Last month, India sent the U.S. government a request for information on a potential purchase of 10 Boeing C-17 Globemaster III military transports, a deal industry analysts say could exceed \$3 billion.
- The F/A-18 Super Hornet has become a strong contender in India’s fighter competition, which is worth as much as \$10 billion. The Super Hornet completed the India phase of the all-important flight trials in August.
- In October, Boeing submitted bids for India’s Heavy Lift and Attack helicopter requirements, offering the CH-47 Chinook and AH-64D Apache.
- India selected BDS to maintain the three Boeing Business Jets operated by the government of India.

These, and other potential India defense requirements, represent a \$31 billion market opportunity for Boeing over the next 10 years, according to Kronenberg. “If we do this right, we’re very well placed to become India’s defense supplier of choice,” he said.

But sales are only half the India success story. Boeing is forging partnerships with Indian companies that will inject new talent and processes into Boeing, making it a



leaner company with lower costs that can win new sales and preserve jobs. “In this new world, partnerships are the only way to go, and we’re building them,” Lall said.

Boeing has placed work packages with large, government-owned Hindustan Aeronautics Ltd. that include F/A-18 gun bay doors and wire harnesses and is sharing Lean+ and program management principles with HAL. If Boeing wins the fighter contract, HAL will assemble 108 of the 126 aircraft in India, as required in the Request for Proposal.

BDS also is exploring partnerships with numerous other Indian companies and has begun signing contracts to satisfy work placement requirements from the P-8I sale. Boeing and India’s Bharat Electronics Limited are jointly developing an analysis

and experimentation center in Bangalore and New Delhi to assist the service branches in understanding how to satisfy future defense and security needs.

Looking back, Chadwick, now president of Boeing Military Aircraft, marvels at the work that has been accomplished in a short time by One Boeing in India.

He also sees a larger legacy. “I believe the U.S., Boeing and India have the potential to build a great and lasting defense partnership,” he said. “And one of the greatest symbols of that partnership can be the Super Hornet.” ■

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PHOTO: Vivek Lall leads Boeing Defense, Space & Security initiatives in India. GENESIS BURSON-MARSTELLER

Endless possibilities

As Boeing grows its ties with India, the company is expanding its message there as well.

With the new year, India became just the

third country outside the United States where Boeing has kicked off a corporate-level image/advertising campaign. Its goal is to build on the good reputation Boeing already has in India, according to Fritz Johnston, vice president of Boeing’s Corporate Brand Management & Advertising.

The theme of the campaign is “One Partnership. Endless Possibilities.”

“This takes advantage of our history

and opens up the story of Boeing as an important partner in India,” Johnston said.

Dinesh Keskar, president of Boeing India, agrees. “We’re not as well-known as a defense company or as a research and technology company in India,” he said. “Now we want to tell the whole story.”

In addition to the placement of ads in

(continued on the top of Page 32)

Made with India

Strong partnerships with India’s manufacturers drive global growth

by Eric Fetters-Walp

The airplane age in India kicked off when Jehangir Ratanji Dadabhoi Tata founded the predecessor of Air India, a major Boeing customer. He went on to lead Tata Sons, the holding company of the Tata Group.

More than 77 years later, a Tata Group subsidiary is building floor beams for Boeing’s new 787 Dreamliner. It’s just one example of the strong partnerships Boeing has forged with a number of Indian aerospace suppliers.

An abundant pool of manufacturing and technology-oriented firms throughout India has made it advantageous for Boeing to fulfill work placement agreements with the country, as well as to make other long-term investments there.

The Indian company with the longest-standing relationship with Boeing is Hindustan Aeronautics Ltd. HAL has been Boeing’s single-source producer of 757 over-wing exit doors since 1991. The firm now manufactures a wider array of components for Boeing Defense, Space & Security and Commercial Airplanes, including the 777 gear uplock box and the gun bay door for the F/A-18 Super Hornet fighter. Last fall, HAL agreed to produce and supply Boeing with flaperons—a composite control surface that is crucial to controlling an airplane’s maneuverability in flight—for 777 jetliners.

“The composite 777 flaperon that HAL will produce represents a significant leap



forward in technological capability, and supports Boeing’s strategy to work in partnership with India’s aerospace industry for the long term,” said Boeing India President Dinesh Keskar.

Aside from airplane parts, Indian firms also provide software used to design and operate Boeing jetliners. Since the late 1990s, Boeing has worked with HCL, Infosys and Tata Consultancy Services on numerous information technology projects. HCL, for example, developed software used on the 787 Dreamliner.

In the years to come, Boeing plans a large role for Indian companies in its expanding industrial strategy in India. Beyond these most visible supplier partnerships, Boeing also is looking to partner with small- and medium-sized companies throughout India.

While Boeing’s wholly owned Indian subsidiary, Boeing International Corporation India Private Limited, works with the nation’s growing aerospace industry, other Boeing businesses such as Aviall and Jeppesen plan to expand with distribution centers and offices, respectively.

As Boeing becomes more involved and invested with India, the services and facilities it establishes there will expand. Of these, the largest is a planned maintenance, repair and overhaul facility in Nagpur. Construction is expected to begin on that this year, Keskar said. ■

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PHOTO: Hindustan Aeronautics Ltd.’s composite shop, shown here, will produce composite flaperons for Boeing 777s. HAL

leading newspapers and business magazines in India, elements of the campaign are incorporated in the Boeing India Web site and printed materials distributed there. "The key thing is that we've taken a very localized approach to this campaign," Johnston said, noting the Boeing ads show a variety of locations across India. The advertisements and messages were conceived in collaboration with

the Boeing India office in New Delhi and an advertising agency there. In the second half of this year, Boeing will begin measuring the brand awareness and impact of the campaign, Johnston said. This type of imaging campaign is a long-term project, he noted, typically lasting a minimum of three years.

While various Boeing businesses advertise their products and services in

trade publications and other venues internationally, the company has launched comprehensive image campaigns in just two nations other than India: the United Kingdom and Japan, Johnston said.

— Eric Fetters-Walp

See the new full-page Boeing India ads on pages 2, 59 and 60 of this issue.

Building business... and communities

Boeing Global Corporate Citizenship is helping make a difference in India

by Alma Dayawon

Along with fostering long-term strategic partnerships in India, Boeing is helping build stronger, healthier communities there.

Although India is the world's second-most populous country, more than half the population resides in rural areas. But rapid development in India's urban areas is changing that balance. Angel Ysaguirre, a Boeing Global Corporate Citizenship community investing specialist who is based in Chicago, visited Boeing's New Delhi office last October, as well as the new Boeing Research & Technology-India center. He was struck by the widespread migration to India's largest cities.

"A lot of the migrants don't expect to remain in the cities, but they do, and so there are 'pop up' worker villages around construction sites that suddenly become communities," Ysaguirre said. Boeing has helped set up schools in these areas and is training residents to make the schools sustainable to benefit the community long after construction is complete, he said.

Boeing supports two nongovernmental organizations in India—Mobile Crèches and Save the Children India—that focus on the health and education of children, particularly those in developing areas. Mobile Crèches operates day care centers at construction sites and slums in 22 locations, providing children with early education services, nutrition and health care. Save the Children India



In India's largest cities, in "pop up" worker villages around construction sites that suddenly become communities," Boeing has helped set up schools and is training residents to make the schools sustainable.

— Angel Ysaguirre, community investing specialist, Boeing Global Corporate Citizenship

provides health, vocational training and education programs.

Boeing International employee Meenakshi Arora began volunteering last year with the Delhi chapter of Save the Children India, and, along with other Boeing employees, has participated in several of the organization's events. "The value that Boeing brings to Save the Children is not just support and sense of

commitment to serve the community," Arora said, "but the ability to try to help make the children's environment and future safe." ■

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PHOTO: Boeing employees assist with an art workshop during a Mobile Crèches event in New Delhi. JOHN WILLIAMS/BOEING



The 3,000-mile assembly line

Desert environment presents unique challenges for Boeing employees working on secure-border program

by Jenna McMullin

Even before the sun creeps over the mountains in Arizona's Sonoran Desert, a small team of Boeing employees make their daily commute to work in four-wheel-drive vehicles along a bumpy one-lane dirt road. The view on either side is miles and miles of arid sands punctuated by Saguaro cactuses. Temperatures soar above 100 degrees Fahrenheit (38 degrees Celsius) most days and the air is dry. Thunderstorms are welcomed for the few hours of shade they yield on scorching hot afternoons.

This rugged desert environment is an assembly line for Boeing's SBInet program, a component of the Secure Border Initiative created under U.S. Customs and Border Protection to provide an integrated system of personnel, infrastructure, technology and rapid response to secure the northern and southern land borders of the United States.

Since being awarded the contract in 2006 to design and deploy an advanced system of cameras, sensors and radars atop towers to monitor border activity, and feed information back to a Border Patrol command center, the Boeing team has moved from development to deployment—a process not without challenges

and delays. The Department of Homeland Security recently announced that the SBInet program will undergo a department-wide reassessment that will include an evaluation of the right balance of SBInet technology, physical fence and Border Patrol agents required to provide control along the southern border.

Today, permanent towers have been built along a section of the U.S. border with Mexico in Arizona; plans are under way for the second deployment in the same region. For Boeing employees, working in the rugged southern border region "brings challenges not typical of a normal workday," said Craig Williams, SBInet production and operations manager.

The Tucson deployment covers about 225 square miles (583 square kilometers). From the SBInet field office in Tucson, Ariz., the nearest tower is about a 90-minute drive south. Cell phone coverage

PHOTO: JR Smith, SBInet deployment project manager, and Dave Reimer, production operations project manager, review a checklist near an SBInet tower at dusk. Towers vary from 40 to 120 feet (12 to 37 meters) in height. MIKE GOETTINGS/BOEING

is spotty and the nearest restaurant is 45 minutes away. Some tower sites are located a stone's throw from a state highway, while others are perched atop ridges accessible only by a one-lane path.

"Extremely hot weather—not to mention monsoons, snakes, tarantulas and the occasional mountain lion sighting—demand extra vigilance and attention to safety, coordination and communication," Williams said.

In May 2009, Boeing SBlnet teams descended upon 13 tower sites in the Border Patrol's Tucson Sector to form the technological framework of the SBlnet Block 1 operational deployment. This included upgrading the command and control facility at sector headquarters in Tucson with new workstations and technologies for receiving information fed from the desert network.

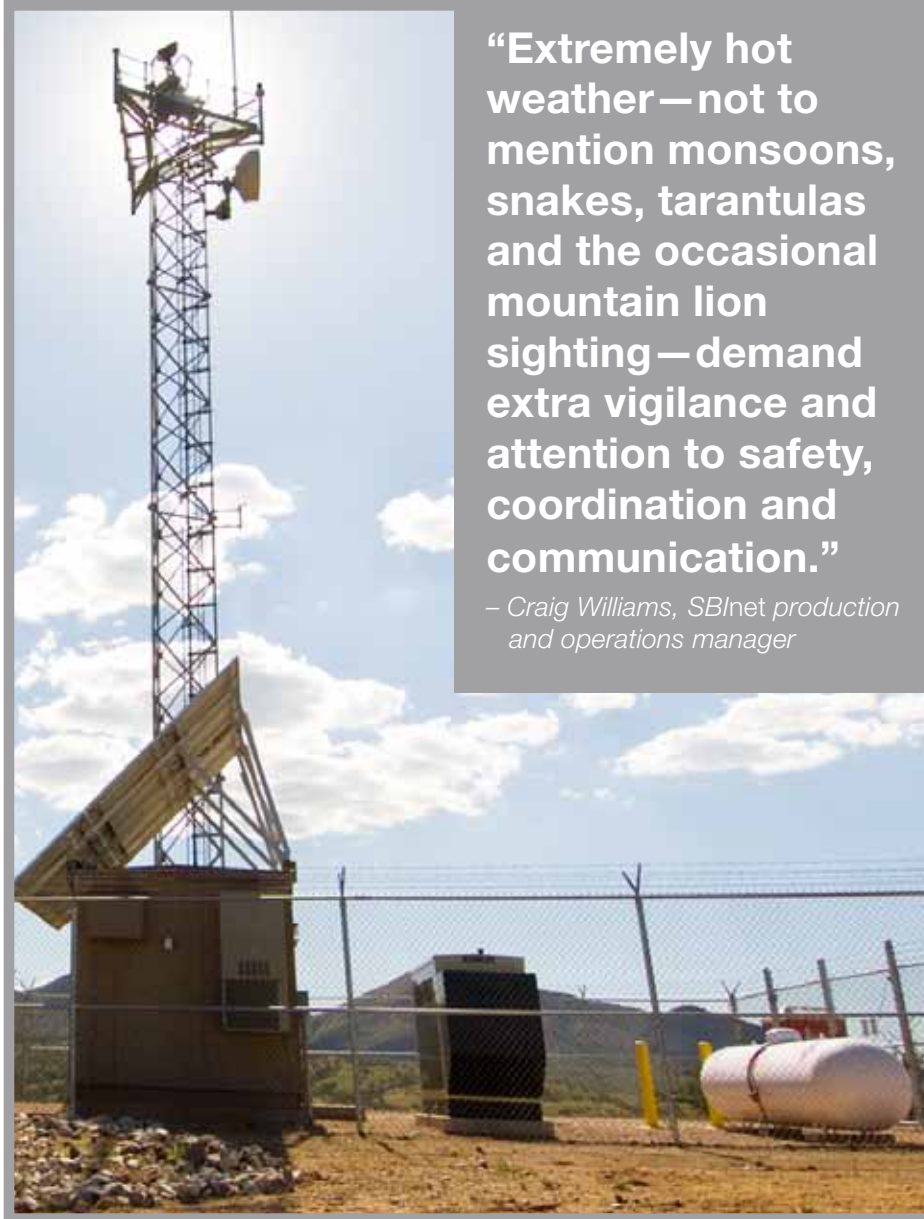
Work included placement by cranes of tower foundation "wafers," piecing tower sections together, and hoisting microwave dishes and radar equipment to the tops of the 80-foot-high (24-meter-high) towers. Teams from across Boeing conducted integration and testing, working with the project's Tucson field office to network components, troubleshoot software, align the system and meet requirements spelled out by Customs and Border Protection.

"This is not your typical factory," said Scot Magill, Tucson deployment production manager, who spent 29 years on the Apache helicopter program before joining SBlnet.

"Apache is built in a factory with all needed support and resources adjacent to the assembly line," Magill noted. "SBlnet program stakeholders stretch from El Segundo, Calif., to Washington, D.C. It's what some call a 3,000-mile [4,830-kilometer] assembly line. In order to communicate and resolve day-to-day issues, you have to take all the required resources with you or have them available via cell phone, Blackberry or satellite phone."

Most SBlnet employees in Tucson are on temporary assignment, meaning they are away from family and home. Each day, dinner—whether it's burgers, pizza, steak or Greek food—becomes all important. "After a long day in the field, this is our chance to relax, enjoy friendships, maybe talk a little football," said Matt Arnold, Tucson deployment operations manager. "It's a great opportunity to connect informally with co-workers, suppliers and our customer." ■

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"Extremely hot weather—not to mention monsoons, snakes, tarantulas and the occasional mountain lion sighting—demand extra vigilance and attention to safety, coordination and communication."

— Craig Williams, SBlnet production and operations manager

More than 2,100 miles

(3,380 kilometers) from the Sonoran Desert, where temperatures head in the opposite direction, another group of Boeing employees is deploying border surveillance capabilities along the U.S.-Canada border. The Northern Border project covers 37 miles (60 kilometers) of the St. Clair River in Michigan and 15 miles (24 kilometers) of the Upper Niagara River in New York. Although the locations are not as remote as the Sonoran Desert, construction teams have seen their share of challenges.

"Before the towers could be erected, an analysis of the soil had to be performed due to proximity to the riverbed. That provided us with the data needed to construct the right kind of foundation to support the 80-foot (24-meter) towers as well as associated video camera and communications equipment," said Scott E. Bell, deployment field coordinator.

Weatherwise it's no picnic for Boeing workers, either. During the winter, temperatures can dip into the single digits Fahrenheit [-13 to -17 Celsius], "not to mention the wind," Bell said.

PHOTO: Boeing SBlnet includes an advanced system of cameras, sensors and radar atop towers such as this one in Arizona to monitor border activity. MIKE GOETTINGS/BOEING

Taking safety to new heights

The platform that houses the SBlnet camera and sensor equipment is triangular in shape, and looking down through the platform floor grids you can see the ground 80 or more feet (24 meters) below.

Welcome to the office space of a Boeing "tower climber"—an employee whose job it is to oversee construction and installation of tower-mounted radars and sensors that detect activity on the northern and southern borders of the United States.

"The SBlnet program is a very unique environment because we're climbing towers. That's why I had to learn the program's specific safety requirements and be recertified," said Don Domonoske, whose 23 years with Boeing have often involved working vertically, whether it was climbing up a tower or down into a missile silo for the Ground-based Midcourse Defense program in Ft. Greely, Alaska. He is on loan to the SBlnet program from Sea Launch.

Over the past 22 months, Domonoske and others on the 240-member SBlnet team have performed their tasks without one lost workday due to injury.

The climbers appreciate the rigorous safety training Boeing requires them to take before they can go "up top." Fall protection training starts at Boeing's Huntsville, Ala., site, where climbers learn U.S. Occupational Health and Safety Administration requirements, how to identify hazards associated with working on the sensor and communication towers, how to document each climb, and the proper use of required safety equipment specific to SBlnet, such as lanyards and harnesses. Training then moves outdoors to a specially built training tower.

The third phase of their training is a required advanced rescue course in which team members are taught how to use safety gear designed specifically to rescue climbers who might have fallen.

"Different scenarios are provided and climbers have to successfully perform 'pickoff rescues' to the satisfaction of the instructor. You cannot be certified as a climber until you successfully pass this third training requirement," explained John Tolleson, a quality assurance inspector with SBlnet since 2006.

One of the newer team members is Kevin Peck, who joined Boeing after graduating from the University of Michigan in 2007 with a degree in aerospace engineering. He supports SBlnet's Northern Border Project as a field engineer and was part of the team that helped install the project's first tower in September 2009 at Marysville, Mich.

Since he has not completed the third part of his



training, Peck can only access the top of the tower via a bucket lift but still dresses in a full harness, hooking to an anchor point on the bucket. Once he safely makes the transfer from the bucket and hooks his lanyard to the platform, he begins verifying that all the tower's radio and sensor connections have been completed correctly by program subcontractors.

Why did Peck, Tolleson and Domonoske sign up for such a job, with its nontraditional work environments, long periods away from home and occasional run-ins with local wildlife? All three agreed it was the uniqueness of the program that drew them to SBlnet. Each feels he is contributing to an important effort to secure the country's borders and, in the process, making things just a little bit safer. Job satisfaction doesn't get much better.

— Lynn Farrow

PHOTO: Martin Pape, a DRS Technologies contractor, installs a radar system while Boeing Quality Assurance Inspector Robert Gavaldon is reflected in the lens. Both are atop a tower platform that holds an SBlnet sensor package. ROBERT GAVALDON/BOEING

The Eagle's mountain home

At a base in Idaho, pilots and ground crews from Singapore's air force are training to operate Boeing's most advanced F-15 fighter **By Lorenzo Cortes**



At Mountain Home Air Force Base in Idaho, Boeing and the U.S. Air Force are preparing the Republic of Singapore Air Force to operate the most advanced F-15 in the world—the F-15SG.

Singapore joins F-15 operators such as the U.S. Air Force, Saudi Arabia, Japan, Israel and the Republic of Korea. The F-15SG is the most advanced of the operationally proven line of multi-role fighters that emerged from the original F-15 Eagle, equipped with an advanced active array radar and other improvements.

Boeing is on contract to deliver 24 F-15SGs to Singapore by late 2011.

"The F-15SG represents a new capability that will enhance the [Republic of Singapore Air Force's] ability to deal decisively with security challenges and contribute to the peace and stability of our region," said Singapore Deputy Prime Minister and Minister for Defence Teo Chee Hean.

Singapore is acquiring the planes and training at the Mountain Home base as part of a program known as Peace Carvin, which allows the Singapore government to buy U.S.-made military jets and receive training at a U.S. Air Force base.

In 2005, Singapore picked the two-seat F-15SG after an exhaustive competition that lasted seven years. The Boeing fighter bested competing types from Europe, including the Dassault Rafale.

The Republic of Singapore Air Force started training with its American counterparts back in 1988 under Peace Carvin I with F-16 fighters. For the fifth and current Peace Carvin program, about 250 Republic of Singapore Air Force pilots, weapons systems officers and their families moved to Mountain Home.

"This is only the latest step of a long, fruitful relationship that the U.S. Air Force and the [Republic of Singapore Air Force] enjoy," Air Force Secretary Michael Donley said.

Boeing is not only responsible for production and delivery of the aircraft but is providing aircrew and maintenance training. This work includes a cockpit trainer with a high-resolution visual display system and networking technologies for simulated missions, which Boeing delivered in 2009.

"The aircrew can practice training or operational mission procedures



"The F-15SG represents a new capability that will enhance the [Republic of Singapore Air Force's] ability to deal decisively with security challenges and contribute to the peace and stability of our region."

– Teo Chee Hean, deputy prime minister and defense minister, Republic of Singapore

before they fly the actual aircraft," said Sharon Vaughn, Boeing's project manager for F-15SG trainers.

The first Republic of Singapore Air Force maintenance crews wrapped up their training in St. Louis in 2009 before Singapore received its first aircraft, and were able to pair their classroom training with work on the F-15SGs being built for delivery.

"We were able to build up the team, give them confidence, get them trained, and send them out to service the aircraft," said Jon Blankemeier, Boeing's manager of F-15 international training.

The F-15, on static display in the U.S. Defense Department "corral" at this month's Singapore Air Show, represents Boeing's legacy of designing products that meet both U.S. and international customers' needs.

The first group of crew is set to return to Singapore in March while training will continue at Mountain Home. Boeing, the U.S. Air Force and the Republic of Singapore Air Force

celebrated in November the inauguration of the Mountain Home detachment, at which time Lt. Col. Lim Chee Meng, the detachment commander for the Republic of Singapore Air Force, spoke about the Mountain Home training.

"The hands-on operation of the F-15SG validates what we've learned in the classroom," he said. "Our crews must undergo a robust training program to ensure they will be able to fully harness the capabilities of the fighter aircraft." ■

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PHOTOS: (Left) The first four F-15SGs are flown to Mountain Home Air Force Base, Idaho, in May 2009. KEVIN FLYNN/BOEING
(Above) Teo Chee Hean, Singapore deputy prime minister and defense minister, tours the elementary school at Mountain Home Air Force Base, Idaho, that children from U.S. and Singapore military families attend. KEVIN FLYNN/BOEING

Knowledge flow

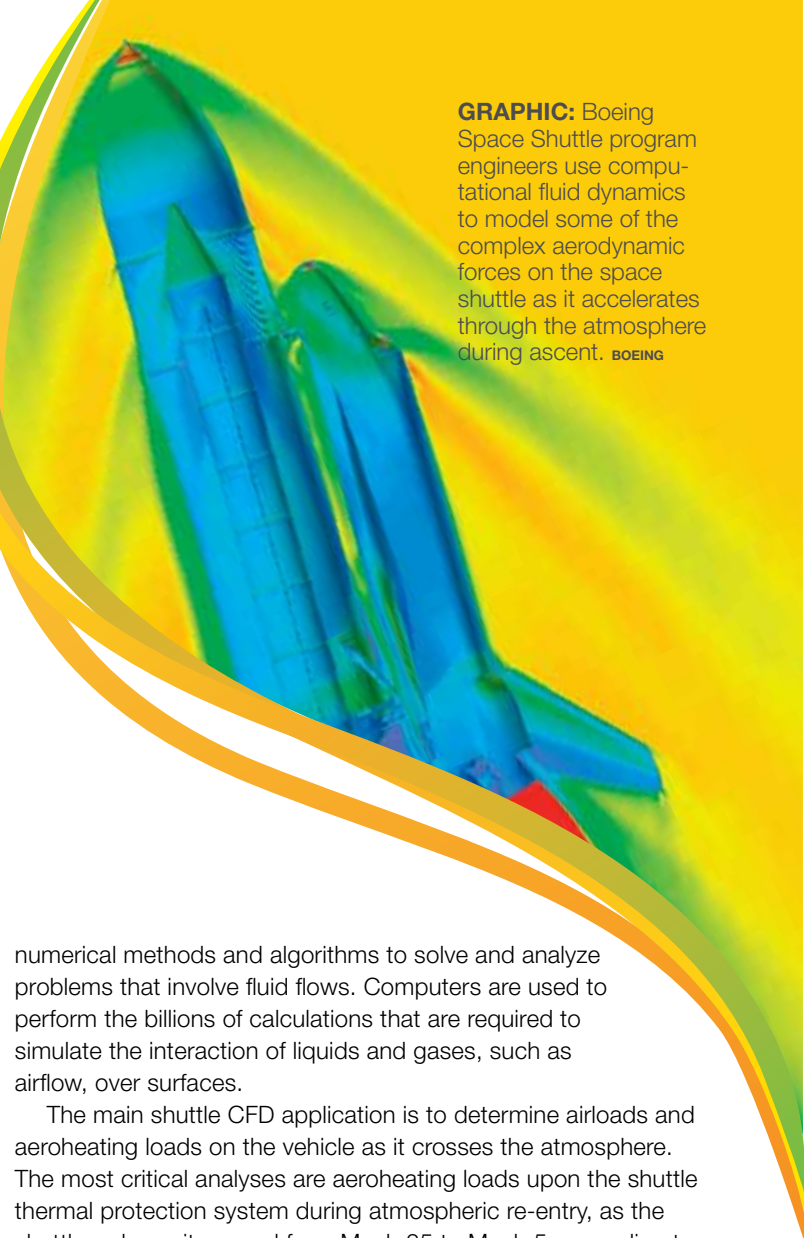
Boeing team expands aero-modeling skills to help keep shuttle crews safer—and better share its expertise companywide

by Ed Memi

Few flying machines can match the aerodynamic complexity of the space shuttle. It travels at subsonic, supersonic and hypersonic speeds, rocketing into space at around 17,500 miles per hour (28,000 kilometers per hour), withstands aeroheating temperatures soaring to 3,000 degrees Fahrenheit (1,650 Celsius) as it re-enters Earth's atmosphere at Mach 25, and then slows to land like a glider.

Key to understanding the diverse environments and risks encountered by the space shuttle—and one of its biggest engineering challenges—is a tool called computational fluid dynamics (CFD). Boeing engineers use CFD extensively on the Space Shuttle program and continue to refine and expand this expertise to reduce risks to shuttle crews—and help Boeing better design and engineer future aerospace vehicles.

CFD is one of the branches of fluid mechanics that uses



GRAPHIC: Boeing Space Shuttle program engineers use computational fluid dynamics to model some of the complex aerodynamic forces on the space shuttle as it accelerates through the atmosphere during ascent. BOEING

numerical methods and algorithms to solve and analyze problems that involve fluid flows. Computers are used to perform the billions of calculations that are required to simulate the interaction of liquids and gases, such as airflow, over surfaces.

The main shuttle CFD application is to determine airloads and aeroheating loads on the vehicle as it crosses the atmosphere. The most critical analyses are aeroheating loads upon the shuttle thermal protection system during atmospheric re-entry, as the shuttle reduces its speed from Mach 25 to Mach 5, according to Georgi Ushev, integrated team manager for the orbiter aero and aeroheating group for the space shuttle.

CFD also is used to analyze critical atmospheric flow and heating applications inside the shuttle. "We might monitor the rate at which the astronauts generate heat in the cabin or the rate at which oxygen is being depleted," Ushev said. "We could be asked to eliminate spots where the air does not circulate properly. If there is a fuel leak somewhere, we can analyze how quickly the gases may spread through the orbiter and whether they are flammable."

The team already has applied its expertise on NASA's Orion Crew Exploration Vehicle Launch Abort System; Ushev said the team's CFD skill and knowledge could be valuable to other programs across and outside Boeing as well.

"Our CFD expertise—in aerodynamics, aeroheating and thermal gas dynamics—is applicable to any new platform required to travel through the atmosphere of Earth, or any other planet," Ushev said. ■

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PHOTO: Georgi Ushev (left), integrated team manager for Boeing's orbiter aero and aeroheating group, analyzes computational fluid dynamics data with teammates Peter McCloud (center) and Peter Jang. BOB FERGUSON/BOEING

3 of a kind

Launch of third Boeing WGS satellite provides U.S. forces global wideband coverage by Dave Garlick

With the December 2009 launch of a third Boeing Wideband Global SATCOM satellite, U.S. warfighters will have access to broadband communications almost anywhere on the planet after the satellite goes into operation in the second quarter of 2010.

Operating over the Pacific, Atlantic and Indian oceans, the trio of satellites will give the U.S. Defense Department more than eight times the bandwidth provided by the constellation of previous-generation military satellites and provide commanders with essential communication capability.

"Now more than ever, our nation depends on our ability to successfully deliver space-based capabilities with 100 percent mission success," Col. Gary Henry, WGS-3 mission director, Military Satellite Communications Wing, Los Angeles Air Force Base, said at a recent WGS press conference.

Building such a high degree of capability and reliability into the system was not without challenges. Rick Lyell, a Boeing mechanical systems engineer who is responsible for the spacecraft's structure and deployment systems, said the biggest challenge for him and his teammates was the two antenna pallet structures on WGS-3. "It took many months of intensive work to make sure the arms holding the 10 antenna dishes that focus the satellite's spot beams folded out correctly to their exact positions in space," Lyell said.

Watching the launch of a satellite they've worked on for a long time also can be an emotional experience for Boeing employees. "You see it move through the factory. You work on it, touch it, and then one day it's gone," said Son Nguyen, a WGS system engineer. "Just like raising kids, eventually you have to let go—we have to put the satellite in space where it can do what it's designed to do."

The next three Boeing WGS satellites will feature additional support for Airborne Intelligence, Surveillance and Reconnaissance missions. WGS-4 is slated for launch in 2011; all six WGS satellites are scheduled to be in orbit by 2013. ■

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PHOTO: The third Boeing Wideband Global SATCOM satellite is positioned in its two-piece launch vehicle fairing at Cape Canaveral, Fla., in preparation for launch on a United Launch Alliance Delta IV rocket in December 2009. UNITED LAUNCH ALLIANCE



Hire education

Boeing's internship program helps attract and develop key entry-level talent by **Elizabeth S. Davis**



While a student at the University of Washington last year, Lindsay Omta completed an internship with Boeing's Shared Services Group in Seattle, where she worked on improving work force management processes and supporting staffing and hiring projects.

"The opportunities and experiences I had last summer were instrumental in my professional development," said Omta, a native of Bellingham, Wash. "The position was extremely challenging. With the support of my team, I learned more in those six months than I thought possible."

Omta, who was hired full time by Boeing as a procurement agent in Common Commodities, Supplier Management, Commercial Airplanes, after she graduated in December, was among more than 900 college and university students from 150 schools who last summer got a taste of what it's like to work for Boeing as part of the company's internship program.

In 2009, Boeing's intern program was ranked 16th by *Business Week* out of the top 50 corporate internship programs. For Boeing, internships help it meet long-range

hiring requirements by attracting, acquiring and developing diverse entry-level talent in critical business areas such as engineering.

"A major program goal is to provide interns with a meaningful experience and exposure to our dynamic workplace. One objective of Boeing's summer intern program is to encourage the next generation of workers to consider making Boeing part of their future," said Bud Fishback, Global Staffing senior manager for College Programs with SSG. However, "it is not a guarantee that all summer interns will find permanent employment within the company," he said.

The recruiting and hiring process begins when recruiting teams visit campuses across the country early in the school year looking for upcoming graduates with key skills and talents. Appropriate candidates are selected for an interview and offers are made, with interns starting work in May. Qualifying students must be enrolled in a college degree program and are typically in their junior

"They tackle complex and challenging projects and bring fresh perspectives to help us build the products we deliver to our customers."

— Bud Fishback, Global Staffing senior manager for College Programs, Shared Services Group



or senior year. The program is highly selective: Only one in 85 students who applied last year was accepted.

Once on the job, interns receive a working knowledge of Boeing programs, products and services. They go on tours, attend special classes and networking events, and participate in mentoring opportunities. Last year, intern program leaders launched a blog, Interns@Boeing, to encourage collaboration and dialogue among interns across the enterprise.

Boeing's interns for 2009, working in 22 states, supported business management, communications, engineering and other key jobs. They had opportunities to apply their classroom learning to everything from contracts and procurement to human resources to airplane configuration and the P-8A Poseidon program.

"They tackle complex and challenging projects and bring fresh perspectives to help us build the products we deliver to our customers," said Fishback, adding: "Our current employees have a breadth of knowledge they can pass on to the newer generations. As we look forward to getting our interns for 2010 on board, this great collaboration is one more way to foster a highly skilled and motivated work force and keep Boeing going strong." ■ elizabeth.s.davis@boeing.com

For more information about internships at Boeing, visit www.boeing.com/collegecareers

PHOTOS: (Left) College intern Lindsay Omta (right) receives a lesson in 737 flight-deck wiring from assembly electrician LaDawn Skinner at Boeing's Renton, Wash., factory. After graduating in December, Omta was hired full time by Boeing. **MARIAN LOCKHART/BOEING (Above)** Some of Boeing's 2009 interns collaborate on a group exercise during orientation in Seattle. The annual event introduces summer interns to the company and allows them to network. **JIM ANDERSON/BOEING**

Boeing's 2009 internship program

The Boeing Company and its heritage companies have had internship programs for years. One of the earliest was established in 1952 between McDonnell Aircraft and Washington University in St. Louis as an on-the-job training program for students completing an engineering degree.

Boeing's current internship program dates from 2003, when the company centralized the Global Staffing organization.

By the numbers

Here's a look at Boeing's 2009 program, by the numbers.

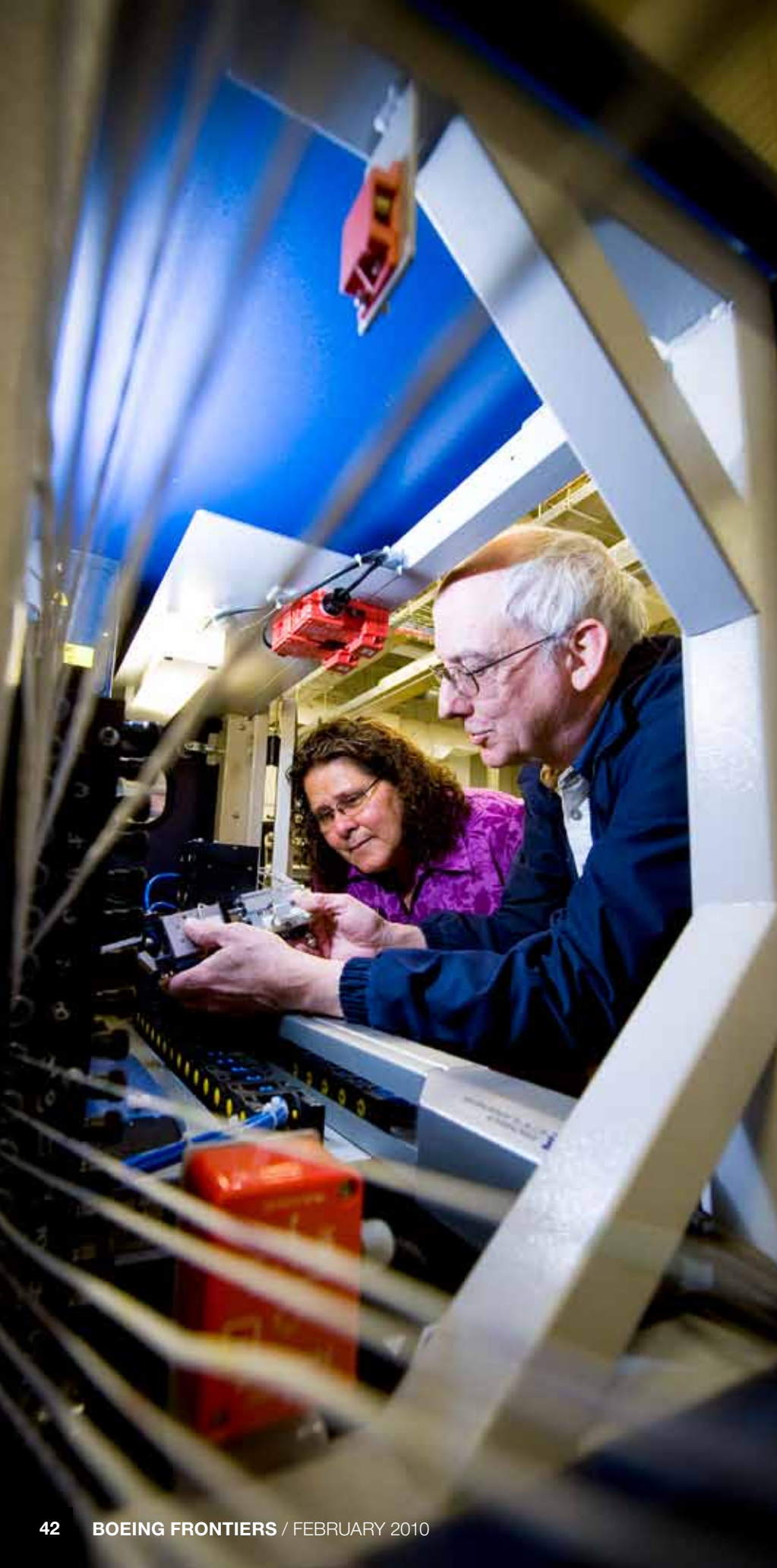
902 interns in 22 states

45 states represented by interns working at Boeing

50 schools represented by one intern each

6,754 students who have participated in Boeing's internship program since 2003

Cool runnings



A Lean+ tool known as Total Productive Maintenance helps keep machinery downtime to a minimum

by Bill Seil and photos by Bob Ferguson

Auto racing fans understand the importance of drivers and pit crews working together to get a car back on the track. The quicker they identify problems and make repairs, the sooner they'll be crossing the finish line.

The same teamwork can be applied on Boeing assembly lines, where production and maintenance personnel have a shared interest in keeping machinery in operation and avoiding unexpected breakdowns. Total Productive Maintenance is helping them do just that.

As one of the tools in Boeing's Lean+ toolbox, Total Productive Maintenance encourages collaboration between production workers and the people who maintain their equipment. Through teaming and organized workshops, all participants find ways to share information and perform tasks together. In some cases, basic maintenance tasks are assigned directly to the equipment operator.

Gerry Patterson, director of Site Services for San Antonio, until recently was responsible for the Total Productive Maintenance program in Wichita, Kan. He said the program combines the expertise of maintenance and operations people to predict where machine faults could

result in downtime. Once identified, the faults are corrected through maintenance or replacement of worn parts. The goal is 100 percent productivity.

"The whole idea behind [Total Productive Maintenance] is to make sure your equipment is available at all times," he said. "Ideally, your equipment should only be shut down for scheduled maintenance."

Boeing's customers rely on these teams to maintain, modify and upgrade their aircraft on time and on budget. Missed schedules mean critical assets are sitting in a hangar in Wichita instead of in service supporting the warfighter.

Total Productive Maintenance has been particularly successful at the Wichita site, which scored a perfect 5.0 during its past two Lean Manufacturing Assessments, and 4.5 the two prior years. Patterson credits two Wichita Site Services Lean+ experts—Ken Peoples and Don Henry.

"To get a 5.0 in anything is almost impossible, and Don and Ken have achieved that for the past two assessments," Patterson said. "They've done a great job."

Patterson noted that some have referred to Total Productive Maintenance as "total predictive maintenance," since anticipating problems is such an important element of the process. But ultimately, the program is a range of steps taken to maximize productivity. It's based, in part, on the belief that an individual who operates equipment day after day has hands-on experience that is invaluable in diagnosing maintenance issues. In fact, Total Productive Maintenance is more than a maintenance concept; it's a



"The whole idea behind [Total Productive Maintenance] is to make sure your equipment is available at all times."

— Gerry Patterson, director of Site Services for San Antonio

culture change that engages everyone in continuous improvement.

Due to Wichita's exceptional performance, Boeing Defense, Space & Security Lean manufacturing leaders asked the team to share their best practices at BDS locations around the enterprise.

Peoples noted that although the concept of Total Productive Maintenance may sound simple, it's based on a detailed approach developed by a unit of Toyota.

PHOTOS: (Left) Mark Walton, a Site Services equipment maintenance technician, works with equipment operator Rosemary Seip to keep the Mesa, Ariz., site's laser marking machines working properly as part of the Total Productive Maintenance program. **(Above)** Gerry Patterson, director of Site Services for San Antonio, until recently was responsible for the highly effective Total Productive Maintenance program in Wichita, Kan.

It requires advance preparation and a strategy that works in concert with the organization's Lean plan.

The predictive maintenance practiced in the program should not be confused with preventive maintenance, according to Peoples. Predictive maintenance bases maintenance needs on the actual condition of equipment, rather than on following a predetermined maintenance schedule.

Vince Tappel, director of Lean programs for the BDS Operations and Supplier Management organization, said the experience of production workers can play an important role in maintaining equipment.

"When people know their machine well, they might have a sense that something's not quite right," Tappel said. "They may notice that it's a little harder to push a handle, or that the machine isn't working the way it used to."

In Mesa, Ariz., Barney Jeffrey, Shared Services Site Services Buildings and Grounds manager, said Total Productive Maintenance is being used to maintain several types of equipment on the Apache helicopter and other BDS military aircraft programs, ranging from wire-braiding machines to transmission test stands.

It's been particularly valuable in keeping the site's laser marking machines in good working order. The equipment measures wire from a spool and marks it. This gives specific information to those building the wire harnesses. Total Productive Maintenance teams also have begun instructing equipment operators in basic procedures required to maintain the laser markers. Production and maintenance personnel now participate in weekly meetings to discuss work assignments and schedules and work together to keep equipment running.

For operations people, equipment downtime is reduced and they learn to handle problems as they arise. Maintenance technicians find they have fewer interruptions, giving them more time for other maintenance duties.

"The neatest thing is the way people are working together," Jeffrey said. "Operators used to say, 'I run it and you fix it.' Maintenance people would say, 'I fix it and you run it.' Now we've joined the two groups and everybody is participating in maintaining the equipment." ■

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PHOTO: In Mesa, Ariz., Site Services leader Rick McKenney (right) consults with FlashJet operator Mike Acosta of Boeing Defense, Space & Security to resolve problems Acosta encountered with a gearbox on the Flash tool, a high-intensity flash lamp used to strip paint from aircraft.



Open source

Here's how engineers are working together, across distances and business-unit boundaries, to help Boeing succeed

by Daryl Stephenson, Dan Ivonis and Bev Holland



"The Engineering function is the company's steward of technical expertise, processes and tools, and its most important responsibility is to make the right technical judgments."

— John Tracy, Boeing chief technology officer and senior vice president of Engineering, Operations & Technology

When Robert Atmur gets a call for help, he has a simple aim: Add value.

"Essentially, that's my job," said Atmur, a Boeing Defense, Space & Security Senior Technical Fellow in electromechanical and power systems who is based in Huntington Beach, Calif. "One of the reasons I'm a member of the Technical Fellowship is because I have demonstrated a capability to go somewhere and add value."

Tom Walton and Sigvard Wahlin, Boeing Commercial Airplanes propulsion engineers on the 777 program, think Atmur's value is as good as gold. The duo sought his assistance in investigating—and ultimately solving—a 777 ultrasonic fuel probe puzzle. "It's cool that at Boeing we can reach out and tap into the enormous amount of expertise throughout the company," Wahlin said.

Now more than ever, Boeing's Engineering function is operating as an integrated companywide organization. It's no longer novel for Commercial Airplanes and BDS engineers to support each other's programs. Nor is it something reserved for emergencies. This is because Boeing has been strengthening the Engineering function over the past several years by integrating it as much as possible companywide and, more recently, by re-emphasizing the importance of technical leadership and excellence (see related story on Page 49).

The function's focus on cross-enterprise integration and technical excellence is being spearheaded by John Tracy, Boeing chief technology officer and senior vice president of Engineering, Operations & Technology. Supporting Tracy are Mike Denton, Commercial

PHOTO: Ken Teasley (left), Commercial Airplanes engineer and integration lead, and Jack Howard, Defense, Space & Security engineer, observe an engine borescope inspection conducted by Commercial Airplanes technicians including Terry Gennow (back). JIM ANDERSON/BOEING

Airplanes vice president of Engineering, who leads the Enterprise Engineering team, and co-leader Rick Bailly, recently appointed BDS vice president of Engineering and Mission Assurance. Mark Burgess, Boeing Research & Technology chief engineer, also is integral to this team.

"The Engineering function is the company's steward of technical expertise, processes and tools, and its most important responsibility is to make the right technical judgments and decisions to assure the highest level of quality," explained Tracy. "We want engineers to be able to seek one another out easily to deal with issues, so that whenever they arise, we will have a mechanism in place that will automatically enable top experts to work on those problems regardless of where they are located."

Denton said Engineering must ensure Boeing is providing the necessary engineers and technical people that programs need to be successful. That means having the right skills, processes and tools on hand when needed.

"We have an excellent enterprise skills team," Denton said. "So when [Commercial Airplanes] needs help on an airplane program, we are able to get highly skilled support from BDS. And, it works the other way around. It's not just a matter of getting more people to help; it's being able to reach out to people who have specific expertise. This makes a big difference."

Bailly said Boeing is doing things today that it could not or would not have done five years ago. "The power of this new environment is that we can now reach

across Boeing and look at how other people are doing things and learn from them, and they from us," he said.

This working-together spirit is what led to Atmur providing assistance on the 777 ultrasonic fuel probe issue. Walton came across Atmur's name after searching the Boeing intranet for an expert in ceramic transducers, a component in ultrasonic fuel probes. Atmur, it turned out, has a unique, extensive knowledge of ceramic transducers.

The fuel probes on the 777 had transducers that were failing earlier than expected. The problem was significant, as the probes send data to flight-deck displays showing how much fuel the

(continued on Page 48)



"I have ... a capability to go somewhere and add value."

— Robert Atmur, Senior Technical Fellow, Boeing Defense, Space & Security

PHOTO: Senior Technical Fellow Robert Atmur has a unique knowledge of ceramic transducers. The 777 team sought his expertise in this field to solve a challenge with ultrasonic fuel probes. PAUL PINNER/BOEING

Dream network

Engineers from all over Boeing teamed to advance the 787 program

by Daryl Stephenson

As a Preliminary Design Review for the 787-9 loomed in mid-2009, teams overseeing specific systems of the airplane, along with their respective suppliers, were concerned that the technical requirements for their systems were incomplete. They wanted a third party to assess the 787 program's processes for determining and managing these requirements.

That request came to the Systems Engineering Core team of Boeing Commercial Airplanes, and what followed was an example of how Boeing engineers are working together across business units, using common processes, training and tools, to help Boeing produce superior products more efficiently and effectively. In this



"I think most of us realize we are part of a bigger team than the one we work with on a day-to-day basis and that we share our destiny across Boeing."

— Joe Massimino, Technical Fellow, Boeing Defense, Space & Security

case, the Systems Engineering Core team learned that a team led by Joe Massimino, a Technical Fellow with Boeing Defense, Space & Security, had extensive experience in evaluating the soundness of systems engineering. They contacted Massimino, who assembled a team that included three engineers from Commercial Airplanes and one from BDS. The team met in Seattle last July for a one-week review of 787 systems engineering work products, interviews with program personnel and observations of program activities.

The team employed a model used to evaluate more than 100 projects in BDS and Commercial Airplanes. After a week, the team achieved its

commitment to "provide a cohesive set of findings and actionable recommendations," Massimino said. The team also used the model to provide a benchmark comparison of the 787 to other Boeing programs.

"We learned a lot from the folks we interviewed and they had a lot of lessons to share," Massimino said. "I think most of us realize we are part of a bigger team than the one we work with on a day-to-day basis and that we share our destiny across Commercial Airplanes, BDS and [Engineering, Operations & Technology]." ■

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PHOTO: Technical Fellow Joe Massimino, who has extensive experience in evaluating the soundness of systems engineering, last summer led a cross-enterprise team that reviewed 787 systems engineering.

MARIAN LOCKHART/BOEING

“We get on the phone and resolve issues quickly. The only way to get a program like this to work is through constant communication and shared destiny.”

– Dennis Eng, systems engineer and leader of the “installation and checkout to in-line” team



airplane has. Replacing the probes is difficult—someone has to go into the fuel tanks to do it. That means an airplane can be out of service a long time.

Over 18 months, the Boeing and supplier team members, with Atmur’s help, discovered that the transducers were failing early because they were being subjected to undue stress, mainly in their production process. The solution: Analyze what steps in production were causing stresses, change them, modify the assembly process and provide more training. The supplier’s engineers endorsed the solution in the fall of 2008 after testing verified that transducers made using the revised processes far outlasted previous transducers. The 777 program has been taking delivery of ultrasonic fuel probes with the new transducers since early 2009.

Atmur, Walton and Wahlin estimated the improvement will save 777 operators at least \$1 million a year in maintenance costs. It has also helped the company’s image, said Atmur. “If you have to take airplanes out of service because of a problem like this, what does that do to the Boeing brand?” he asked.

Here are two more of the many examples of how an integrated Engineering function is supporting Boeing.

Dennis Eng, a systems engineer and leader of the Commercial Airplanes team’s “installation and checkout to in-line” effort, is working with his BDS counterparts to make sure the P-8A Poseidon program remains on the leading edge. Boeing is assembling and testing five P-8A long-

range anti-submarine warfare, anti-surface warfare, intelligence, surveillance and reconnaissance aircraft for the U.S. Navy as part of a contract awarded in 2004.

Eng works closely with Keith Smith, P-8A director of Mission Systems with BDS, and an integrated Commercial Airplanes-BDS team to determine which work packages currently being performed in installation and checkout can be more efficiently completed upstream—at final assembly in Renton, Wash., or with suppliers. Installation and checkout, the final step in the production process, is where BDS employees install and integrate mission systems and perform any remaining modification work.

“Constant communication has been the key to our success from the beginning,” Eng said. “We get on the phone and resolve issues quickly. The only way to get a program like this to work is through constant communication and shared destiny.”

The BDS design for the Airborne Early Warning & Control aircraft, which is based on the 737-700 commercial jetliner, owes much to the help of Commercial Airplanes engineers. When it comes to the engines, BDS engineers figure that nobody knows them as well as Commercial Airplanes Propulsion Systems do.

“BDS has worked with [Commercial Airplanes] to develop configuration modifications for years,” said Jack Howard, a BDS mechanical systems engineer for the airplane. “When issues arise during certification and we need expertise on engines, the commercial side

has the experience with the airplane.”

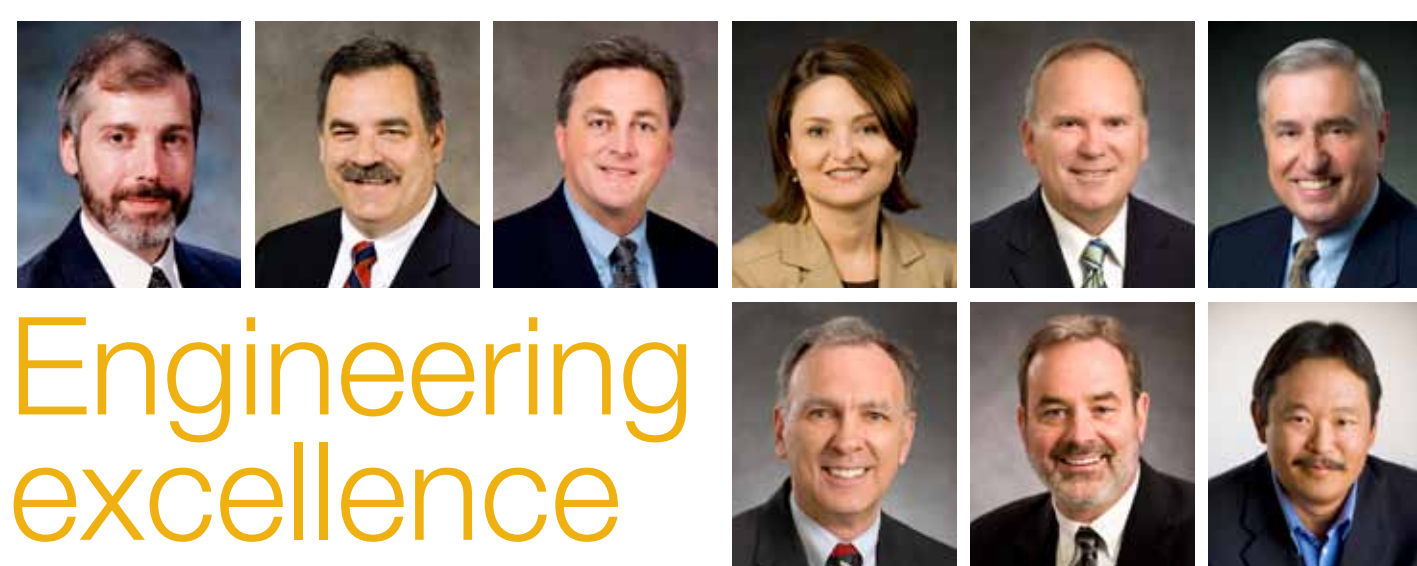
His counterpart in Commercial Airplanes, integration lead Ken Teasley, noted that before work on the first derivative airplane began, Propulsion Systems worked with engine manufacturer CFM to develop modifications to be able to certify the AEW&C version to commercial aircraft regulations. “That was an essential step in the process,” Teasley said. In fact, all systems modified in the aircraft had to be certified for the new derivative, and BDS worked with Commercial Airplanes to accomplish that feat.

Teasley and Howard have been through several design issues that have taken ingenuity to resolve. One involved engine wire bundles. “During testing, we found interference between an engine wire bundle and the electrical system power feeder,” Teasley said. “It took working together between Propulsion Systems, BDS and the engine manufacturer to develop and certify a bracket that would hold the two separately and meet requirements.”

The working relationship of the two engineers has been open and respectful, according to Teasley. “We don’t focus on either BDS or [Commercial Airplanes] as different businesses,” he said. “We make sure we are doing the right thing for Boeing.” ■

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PHOTO: Defense, Space & Security P-8A director of Mission Systems Keith Smith (left) and Dennis Eng, Commercial Airplanes systems engineer, determine where work tasks should be handled. ALAN MARTS/BOEING



Engineering excellence

New engineering leadership positions established to further strengthen function, ensure technical integrity **by Junu Kim**

The B-17 Flying Fortress. The CH-47 Chinook. The Apollo spacecraft and the Saturn rocket. The DC-3. The 707 and 747. The F-4 Phantom and the P-51 Mustang. With a historical portfolio of products such as these, Boeing stands out as a global icon of engineering capability.

Behind this portfolio are engineers whose technical creativity, judgment, leadership and determination have turned visions into reality. Indeed, that many of Boeing’s products stand out as icons of engineering is testament to the fact that Boeing has been the home of many great engineers. A roll call of these engineering legends would include Lee Atwood, Herman Barkey, Harold Rosen, Ed Schmued and Joe Sutter, among many others.

The bold demonstration of technical savvy and leadership by these iconic engineers in part led Boeing last month to create several new senior-level engineering positions around the company. They were established to re-emphasize the importance of technical excellence at Boeing—and to complement other efforts to achieve functional excellence in Engineering.

“Revitalizing the critical role of senior engineering leaders will help ensure that engineering excellence continues to be driven through all our products and services to satisfy our customers and grow our company,” said John Tracy, Boeing chief technology officer and senior vice president of Engineering, Operations & Technology.

Appointed as vice presidents of Engineering, the nine engineering leaders are all recognized authorities in technical fields critical to aerospace development. They will work closely with program managers and chief engineers to help ensure the technical integrity of Boeing products by providing technical guidance.

The leaders and their technical areas of responsibility are:

Boeing Defense, Space & Security

- Bill Carrier: Structures
- Laurette Lahey: Flight & Controls
- Jack Murphy: System-of-Systems / Systems Engineering
- Darrell Uchima: Mission Systems Payloads & Sensors
- James Farricker: Networks & Communications

“A more robust Engineering function will ensure that the next chapters of Boeing’s story are as awe-inspiring as the past ones.”

– John Tracy, Boeing chief technology officer and senior vice president of Engineering, Operations & Technology

Boeing Commercial Airplanes

- Mike Delaney: Airplane Performance & Product Architecture (at press time, Delaney was named vice president of Engineering for Commercial Airplanes; Mike Denton, who previously held this role, was named president, Boeing Japan)
- Keith Leverkus: Propulsion Systems
- Jim Ogonowski: Airplane Structures
- Mike Sinnett: Airplane Systems

As part of the new assignments, Delaney, Ogonowski and Sinnett will continue their focus on the 787 program.

These appointments represent another in a series of strategic steps Boeing has taken in recent years to strengthen its drive for functional and program excellence. These actions have created benefits such as allowing experts enterprisewide to tackle engineering challenges, regardless of in which business unit the problem exists (see related story on Page 45).

By focusing the technical expertise of proven leaders on the company’s engineering challenges, Boeing is further strengthening its ability to ensure that engineering quality, effectiveness and efficiency are being driven into the design, development and production of all its products and services, Tracy said. “A more robust Engineering function will ensure that the next chapters of Boeing’s story are as awe-inspiring as the past ones,” he added. ■

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PHOTOS: To ensure engineering excellence, Boeing named nine vice presidents of Engineering: (clockwise, from top left) Bill Carrier, Mike Delaney, James Farricker, Laurette Lahey, Keith Leverkus, Jack Murphy, Darrell Uchima, Mike Sinnett and Jim Ogonowski. BOEING

2010 — a critical juncture



Boeing last year continued to improve its environmental performance and workplace safety. Its Environment, Health and Safety leader explains what's in store for the year ahead.

by Jennifer Cram

Boeing recorded numerous achievements last year in the area of environmental performance, both in its products and its operations, and workplace safety. These accomplishments ranged from collaborating on demonstration flights powered in part by sustainable biofuels to being recognized for green building design to launching Safety Now, a companywide effort to create even safer workplaces.

How will Boeing continue this momentum, especially amid today's economic challenges? Mary Armstrong, vice president of Environment, Health and Safety, recently sat down with *Frontiers* to discuss the company's plans for the year ahead.

How has the economic downturn affected Boeing's environmental and safety focus?

The economic headwinds we're facing make us even more focused on meeting our business commitments by improving our environmental and workplace safety performance. We've seen many fantastic examples where impressive cost savings and productivity improvements arise from a reduced environmental

footprint and lower injury risks. Our Lean+ tools are critical enablers to drive eco-efficiency across our enterprise and our supply chain, and create even safer workplaces. These business results benefit our employees, our communities, our customers and our suppliers.

What are you anticipating for 2010?

This is a critical juncture. We have a good foundation, an enduring strategy and effective integration across the company to help sustain our environmental and workplace safety progress. Yet we cannot stand still.

Our government and commercial customers are clearly calling for environmentally progressive solutions. We must pioneer new technologies to help them achieve their goals for environmental performance, and energy efficiency and independence. We'll

PHOTOS: (Left) Mary Armstrong, vice president of Environment, Health and Safety. **BOB FERGUSON/BOEING (Above)** Boeing last year introduced a chrome-free primer and chrome-free exterior decorative paint that can be applied to jetliners such as this 777-300ER for KLM Royal Dutch Airlines. **TIM STAKE/BOEING**



PHOTOS: (Above) Tailored Arrivals project leader Rob Mead and Suzanne Meador, engineering leader for Tailored Arrivals operations at Los Angeles International Airport, check out a 747-400 simulator for a demonstration of how the Boeing-developed air traffic management flight procedure saves fuel and lowers emissions. **JIM ANDERSON/BOEING (Right)** Steve Wyatt, with the Security & Fire team in El Segundo, Calif., is one of the many Boeing employees who support environmental activities by volunteering in local communities. **BOEING**



also continue to drive environmental improvements in our operations.

How is Boeing and the aviation industry preparing to operate under carbon constraints?

Aviation accounts for approximately 2 percent of global man-made carbon dioxide emissions. That's projected to grow to 3 percent by 2050, so this is a serious issue for our industry. Boeing has played an important role in helping to bring the aerospace industry together to address climate change concerns. In fact, at the recent United Nations Climate Change Conference in Copenhagen, aviation was the only industry to propose a plan to reduce carbon dioxide emissions. That plan includes fuel efficiency improve-

ments of 1.5 percent per year until 2020, and carbon-neutral growth after 2020.

Boeing is taking action to help protect our ecosystem by reducing emissions from our products and supporting the establishment of a global aviation fuel efficiency standard for new airplane designs. We're advancing alternative energy solutions, such as sustainable biofuels, and developing technologies to help improve the air traffic system. We're also working to lower our own greenhouse gas emissions through the U.S. Environmental Protection Agency's Climate Leaders program. And we're developing innovative solutions to help improve the efficiency of the nation's electric grid, which will also help reduce carbon

dioxide emissions by homeowners and businesses around the United States.

Is Boeing on track to meet its environmental goals?

Thanks to employees across the company who are unleashing their innovation and passion to attack environmental waste, we're making good strides to meet our five-year targets. Those are for 25 percent improvements in greenhouse gas emissions intensity, energy efficiency, recycling rates and hazardous waste at our major sites.

We're embedding design tools that allow engineers to evaluate environmental considerations in our products and services, just as they evaluate cost, weight and mission performance. We've also made great progress in driving environmental



Highlights of Boeing's environmental and workplace safety performance in 2009

January:

- Together with Boeing and engine companies, Continental Airlines and Japan Airlines conduct demonstration flights powered in part by sustainable biofuels.

February:

- Boeing announces that all of its major manufacturing facilities were certified to the globally recognized ISO 14001 environmental standard in 2008.

March:

- Safety Now, a companywide effort to create even safer workplaces, is launched.
- Boeing transitions to recycled paper in its offices and factories.

May:

- Boeing releases its environment report, announcing the company outperformed its one-year plan for its operational environmental targets.

September:

- The Carbon Disclosure Project, an investor index, recognizes Boeing as the top-performing industrial company in climate change disclosure.

October:

- Boeing is recognized for green building design with LEED Gold certifications in Houston and Kent, Wash.

November:

- An ongoing demonstration of Tailored Arrivals, which reduce fuel use, emissions and noise, begins at Los Angeles International Airport.

December:

- The 787 Dreamliner, designed to increase fuel efficiency and reduce emissions, makes its first flight.

PHOTO: Boeing Shared Services Group employees Mark Pearson (left) and Dennis Ronholt discuss sustainable features of the 18-26 building in Kent, Wash. This building in 2009 earned Gold certification from the Leadership in Energy and Environmental Design, or LEED, program—the U.S. benchmark for green building design.

ALAN MARTS/BOEING

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“Our government and commercial customers are clearly calling for environmentally progressive solutions. We must pioneer new technologies to help them achieve their goals for environmental performance, and energy efficiency and independence.”

thought and capability into our supply chain, and are well along in working with our suppliers on contract expectations and collaboration opportunities for environmental gains.

How are we progressing on Safety Now?

Boeing has always had strong safety practices, and we are moving to the next level as we strive for injury-free workplaces. Through Safety Now, we are aligning and focusing our workplace safety efforts in a way we've never done before. And Engineering is engaged in designing workplace safety solutions in our processes and our products.

As we did with the environment, we've set aggressive goals to improve our safety performance across the company. By 2013, we intend to improve safety performance 25 percent, as measured by lost workday case rate. We've set a very visible target. We report our progress regularly and we'll give employees tools to drive continuous safety improvements.

Boeing has remediation projects in some locations. Are we making real progress?

We finalized our cleanup efforts at 12 sites in 2009, which is great progress and allows us to focus our remediation efforts on the more challenging locations. Boeing is working with stakeholders at two of our biggest remediation sites, Santa Susana in California and the Duwamish area in Puget Sound, to remove contamination and move forward on cleanup plans. We've increased our transparency and are working closely with communities on effective solutions. Unfortunately, as was the case recently at Santa Susana, sometimes we have to go to court to protect our legal rights. We reluctantly filed that lawsuit. We remain committed to protecting Santa Susana as open space, and cleanup will continue while the court resolves legal issues.

When discussing remediation in general, it's important to note that many locations we're cleaning up followed generally accepted environmental procedures for their time. But what was acceptable in the past has resulted in large cleanup efforts today. That should spur all of us to find ways to reduce waste, use fewer chemicals and lower our environmental footprint now, so we won't need to clean up new sites in the future. ■

Boeing Company – BA

NYSE: Industrials/Aerospace & Defense

As of 1/22/10

\$57.77

Stock snapshot

52-week range:	
52-week high	\$62.31
52-week low	\$29.05

International competitors

EADS* – EAD.PA	
As of 1/22/10	14.19
52-week range:	
52-week high	16.57
52-week low	8.12

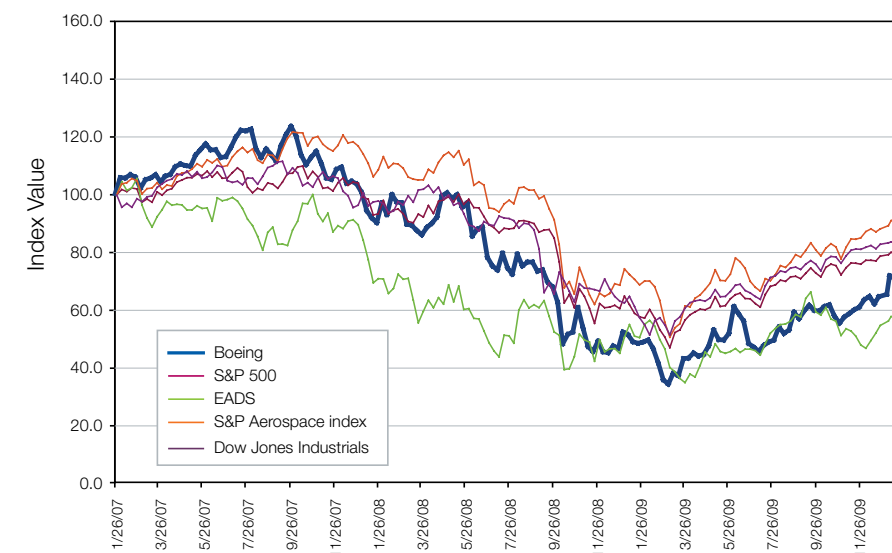
*Prices in euros

U.S. stock indexes

S&P 500	
As of 1/22/10	1,091.76
52-week range:	
52-week high	1,150.45
52-week low	666.79
S&P 500 Aerospace and Defense Index	
As of 1/22/10	334.80
52-week range:	
52-week high	352.83
52-week low	194.13
Dow Jones Industrials	
As of 1/22/10	10,172.98
52-week range:	
52-week high	10,767.21
52-week low	6,440.08

Stock price chart

The chart below shows the stock price of Boeing compared with other aerospace companies, the S&P 500 index, the S&P 500 Aerospace and Defense Index, and the Dow Jones Industrials. Prices/values are plotted as an index number. The base date for these prices/values is Jan. 26, 2007, which generates three years of data. The prices/values on that date equal 100. In other words, an index of 120 represents a 20 percent improvement over the price/value on the base date. Each data point represents the end of a trading week.



Boeing stock, ShareValue Trust performance

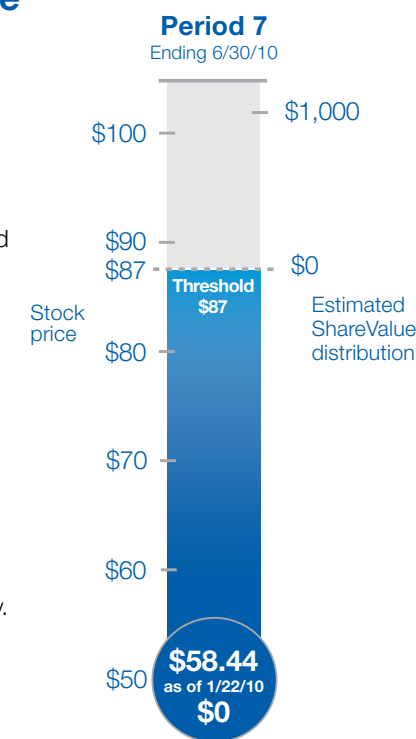
ShareValue Trust, or SVT, is an incentive plan that allows eligible participants to share in the success of their efforts to improve productivity and grow the business.

The program—which runs for 14 years and ends in 2010—features seven overlapping investment periods. The program is currently in Period 7.

This graph shows an estimate of what a “full 4-year participation” ShareValue Trust distribution (pretax) would be for Period 7 if the end-of-period average share prices were the same as the recent price shown.

The share price shown is the average of the day's high and low New York Stock Exchange prices. Updates to participant/employment data will be made periodically.

For more information on the ShareValue Trust, visit www.boeing.com/share.



IN MEMORIAM:

The Boeing Company offers condolences to the families and friends of the following employees.

Steven Ainsworth, project management specialist; service date May 29, 1980; died Nov. 26

Imogene Anderson, office administrator; service date July 30, 1992; died Dec. 10

Ellen Anthony, integrated support technician; service date April 25, 2008; died Dec. 21

Thomas Camacho, inspector; service date July 6, 1966; died Jan. 8

Robert Culpepper, assembly and installation inspector; service date July 13, 1987; died Jan. 14

George Custer, system design specialist; service date June 19, 1989; died Jan. 21

David Dasler, product data management engineer; service date July 10, 1973; died Dec. 12

Terry Dickerson, software engineer; service date June 14, 1982; died Dec. 17

Byron Dickey, machine repair mechanic; service date June 21, 1975; died Dec. 7

Michael Dunlap, expeditor; service date Dec. 12, 1978; died Dec. 23

Richard Eggers, wire design and installation engineer; service date Aug. 26, 1963; died Nov. 24

Paul Gant, product repair/modification technician; service date July 19, 2007; died Jan. 13

Grant Gittins, assembler and installer; service date April 25, 2008; died Jan. 17

John Gobeille, assembler installer general; service date Feb. 12, 1979; died Dec. 11

John Gulbranson, program management specialist; service date Sept. 12, 1981; died Nov. 30

Janna Hickel, staff analyst; service date Nov. 29, 1998; died Jan. 3

Cecile Howell, writer and editor; service date Dec. 15, 2000; died Dec. 25

Walter Hyry, procurement analyst; service date May 4, 2007; died Dec. 16

John Jacobsen, tie bar shot peen mechanic; service date June 15, 1987; died Nov. 30

Mary King, benefits specialist; service date Jan. 8, 1990; died Jan. 16

Michelle Knoch, software engineer; service date Aug. 14, 2000; died Jan. 20

Francis Lawler, flight-test mechanic; service date Aug. 31, 1993; died Nov. 23

David Lewis, manufacturing planner; service date April 24, 1989; died Dec. 12

Burvin Lindsey, software engineer; service date Jan. 12, 1998; died Dec. 11

Sonia Martin, procurement agent manager; service date Dec. 7, 1981; died Dec. 24

William O'Brien, assembler installer, structures; service date Sept. 9, 1985; died Jan. 1

Jerald Pazdalski, tie bar shot peen mechanic; service date June 22, 1987; died Nov. 10

Kim Peterson, engineer; service date Nov. 16, 1977; died Jan. 12

Brian Phelps, tool- and die-maker; service date Oct. 12, 1981; died Nov. 21

Bruce Powell, maintenance program engineer; service date Feb. 22, 1988; died Jan. 14

Thomas Rodman, materials processor requirements facilitator; service date Oct. 15, 1979; died Dec. 18

Daniel Smith, procurement agent manager; service date June 11, 1981; died Dec. 3

Susan Smith, engineering technical specialist; service date Jan. 20, 1976; died Dec. 26

Ray Starnes, tool project specialist; service date Oct. 25, 1977; died Nov. 24

George Steele, numerical control programmer; service date July 5, 1978; died Nov. 2

Guy Townsend, information technology project management specialist; service date Sept. 1, 1984; died Dec. 5

Charles Wade, versatile technologist; service date Oct. 20, 2003; died Jan. 9

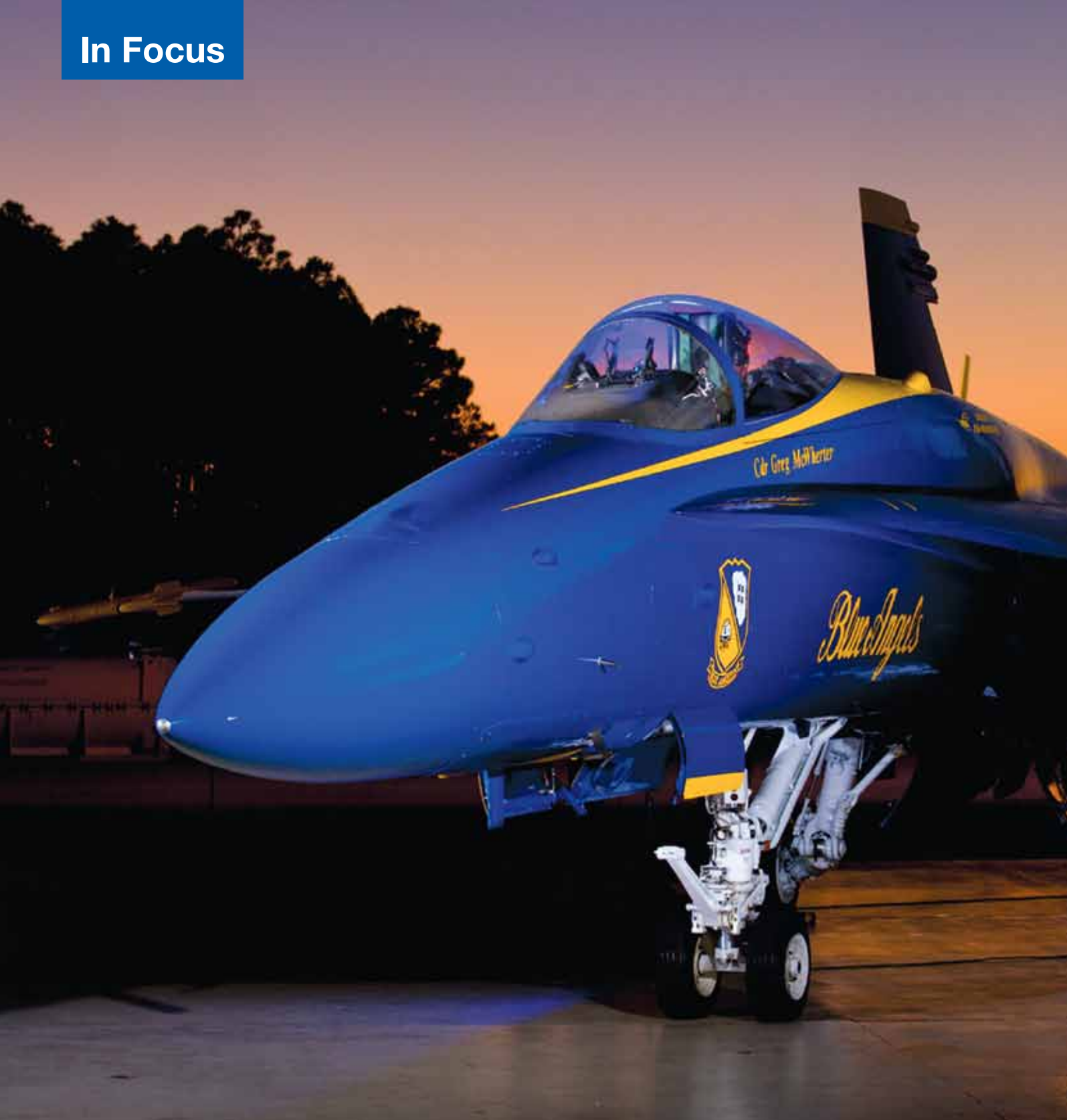
Danny Tse Chun Wang, manufacturing planner; service date July 23, 1986; died Dec. 20

Gary Warren, engineer; service date April 21, 1993; died Jan. 4

Brian Weber, sheet metal assembler and riveter; service date Sept. 24, 2009; died Jan. 13

Paul Wilcott, service technical analyst; service date Sept. 20, 1965; died Jan. 7

Felicia Wilson, manufacturing engineer; service date April 16, 2005; died Jan. 18



BOEING AND THE BLUES

With its Boeing F/A-18 Hornets crisscrossing the sky in knife-edge precision, the U.S. Navy's Blue Angels aerobatic demonstration team has thrilled millions at air shows around the world. But the Boeing connection with the Blues doesn't end with the aircraft. For nearly a quarter-century, Boeing Shared Services Group has produced the Blue Angels' team yearbook, video and other printed

material for each air-show season. This photo, from the Blues' 2010 yearbook, shows a Hornet at sunset at the Naval Air Station in Pensacola, Fla., home base for the Blue Angels. For more photos of the Blue Angels by Boeing photographer Ron Bookout, visit www.boeing.com/news/frontiers/archive/2010/february/qt_infocus.html on the *Frontiers* Web site. PHOTO: RON BOOKOUT/BOEING



**ONE PARTNERSHIP.
ENDLESS POSSIBILITIES.**

India's inspiring progress is matched only by its will to protect itself. And in Boeing, India finds a willing and able partner. One who understands and delivers customized defence solutions. One who will work to enhance indigenous defence capabilities, and become India's trusted aerospace partner. With a partnership as focused as this, the possibilities of what's to come are, indeed, endless.

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ONE PARTNERSHIP. ENDLESS POSSIBILITIES.

With Boeing as a trusted partner, the flight to success for India's aerospace industry promises to be a short one. We're committed to expanding the manufacturing and engineering base through key partnerships. Backing them up with industry best practices such as program management and aerospace and lean manufacturing processes. Propelling the Indian aerospace industry to the global stage, the possibilities of how high this partnership will soar are, indeed, endless.